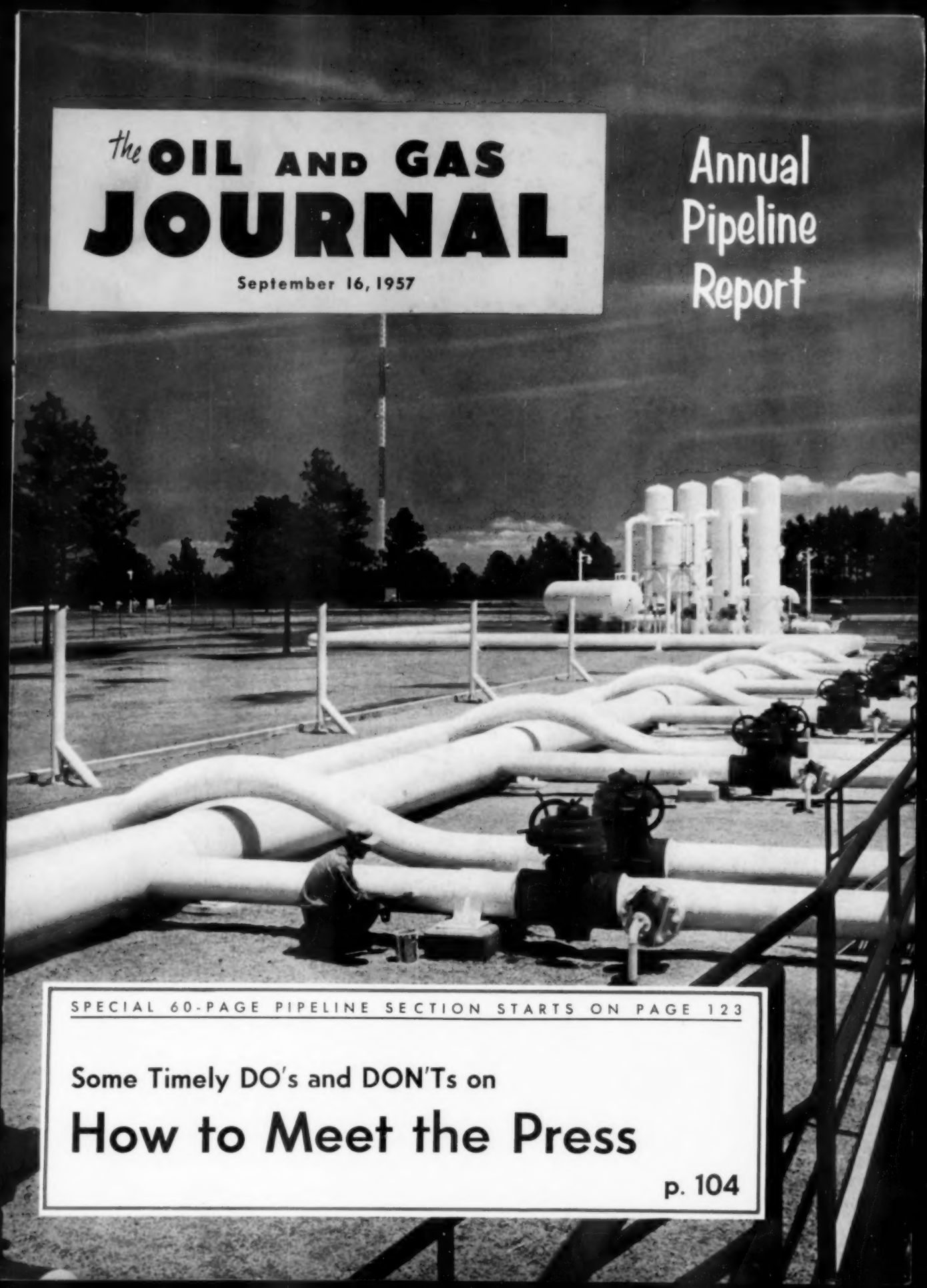
the OIL AND GAS JOURNAL

September 16, 1957

Annual Pipeline Report



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Some Timely DO's and DON'Ts on

How to Meet the Press

p. 104

How To
PREVENT HEADER HEADACHES

Leaking, cantankerous production header valves are always costly in terms of lost manpower and repair bills. That's why so many lease operators rely on lubricated plug valves to insure easy operation and rugged dependability . . . *at lowest cost per year.*

For over forty years, Rockwell-Nordstrom lubricated plug valves have been preferred and specified by oil field men all over the world. They have learned that *pressurized lubricant sealing* means positive shut-off on any service. And the lubricant-smooth, quarter-turn operation can't be matched for fast, instant closure.

Rockwell-Nordstrom valves are available in a complete range of sizes and pressures for every oil field service. For complete details, see your supplier or write to Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. Canadian Valve Licensee: Peacock Brothers Limited.

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Nordstrom
VALVES

Lubricant Sealed
For Positive Shut-Off

ROCKWELL

JOURNAL News Letter

Sept. 16, 1957
Tulsa, Okla.

Efforts to unionize rig crewmen in West Texas have fizzled:

Unionized rig crewmen in the Permian basin face up to a resounding defeat in their first open attempt to organize other drilling personnel and to enforce their demands for better working conditions.

The Union launched an early summer drive to bring basin drilling contractors to heel by picketing and other harassment. It gradually melted away to sporadic and isolated picketing in the Lamesa, Tex, area. It now has sputtered out entirely.

Key to halting the movement was the arrest last May at Seminole, Tex., of four leaders of Local 672 of the International Union of Operating Engineers. The leaders were accused of destroying contractors' property and unlawful assembly.

The union never recovered its strike momentum after that blow.

Union leaders now say evasively they are studying future moves.

Basin contractors say the drive was doomed by these factors: Union membership claims were exaggerated... Working conditions on the rigs weren't so bad as pictured... Labor market in the area permits contractors to hire new men faster than the local can unionize them.

Contractors maintained from the first that the union's threat to shut down all basin drilling activity if demands were not met was a lot of hot air. Events to date have borne out their analysis.

Astute labor reporters say odds are 60-40 favoring an auto strike next June 1 and 65-35 for a long steel strike in 1959.

Their reasoning: Management has about reached the point of no return in passing on fat wage boosts to consumers. Company representatives will give ground very grudgingly to labor demands in coming negotiations.

A new breed of scientist--the radiation chemist--is finding an important place in oil technology.

Steeped in chemistry and physics, he is looking into brand-new possibilities the atomic age has brought to oil processors. Most of his time

now is spent studying how nuclear radiation affects reactions of oil hydrocarbons.

At the annual meeting of the American Chemical Society in New York last week, 12 of these pioneers gave a progress report. The essence of their reports: We are just beginning to nibble around the edges of this new area of technology.

Some interesting developments revealed:

Petroleum fractions exposed to cobalt-60 and to nuclear reactors show higher thermal cracking conversions than when exposed to high temperatures alone. Composition of products was closely similar under both conditions.

Radiation of normal paraffins results in breaking the carbon-hydrogen and carbon-carbon bonds. Secondary reactions result in an end product consisting of hydrogen and saturated and unsaturated hydrocarbons of a wide molecular-weight range.

Irradiated benzene also breaks down. It then recombines in a wide range of polymers. Work is under way to isolate the initial products of irradiation before they recombine. This could give clues to the primary process occurring.

Nation's first privately owned nuclear-testing reactor, meanwhile, is being discussed by a combine including Phillips Petroleum.

In the deal with Phillips are Kaiser Engineers, Lockheed Aircraft, and ACF Industries.

They are surveying economics of the center. It would operate a very high-flux test reactor and other facilities to test nuclear component irradiations and to make radioisotopes. Its services would be available to domestic and foreign industry, government agencies, and educational institutions.

Any relief granted protesting importers won't upset the control program.

A half dozen companies are now demanding import quota increases totaling well over 55,000 bbl. daily. A panel headed by Capt. M. V. Carson, administrator of the import program, is hearing their cases.

Carson reportedly has been granted a "relief fund" ranging from 75,000 to 100,000 bbl. daily to take care of hardship cases without throwing the control plans out of kilter.

Where's the romance in politics and oil?

President Giovanni Gronchi of Italy and Enrico Mattei, chief of Italy's government oil agency, have discovered their fame is less widespread than that of Italian actress, Gina Lollobrigida.

Gronchi and Mattei were in Iran last week for formal signing of the Iranian-Italian oil deal. Teheran crowds identified the two as "from Gina's country."

Teheran 5-percenters and oil company officials alike are pondering the implications of a terse announcement last week by National Iranian Oil Co., the government company in Iran.

The company announced requests for information or proposals of any nature concerning oil in Iran must be directed to the N.I.O.C. chairman. It added: "Any communication made through other channels shall have no effect."

Use of pastel-colored paints on industrial installations may become a vogue.

Texas Gas Transmission Corp. is reaping benefits from its new painting scheme. It repainted all its 22 compressor stations, including buildings, piping, and processing units, using compatible pastel shades.

The result: Better worker morale and efficiency, better public relations with nearby communities which appreciated the change from drab gray and aluminum, and costs no higher than previous painting jobs (p. 128).

Alberta oil producers get a new proration schedule January 1.

It provides a two-stage depth-bracket allowable system geared to an over-all 9-1/2-year payout on wells. The stages are:

Initial economic allowance for first 7 years of a field's life. Wells will have minimum allowable ranging from 30 to 190 bbl. daily depending on depth.

Operating economic allowance for next 2-1/2 years. Wells will have minimum allowance from 25 to 73 bbl. daily. These will range from 80 per cent of initial economic allowance for shallow wells to about 38.5 per cent for deeper ones.

Under the plan, maximum production rate of a well will have greater weight in determining its share of any demand left when basic allowables are satisfied. The province will put the MPR formula into effect in 1960. Under it the prorated allowable will be equal to an economic allowance plus some fraction of the difference between MPR and the economic allowance.

Rotary-rig activity has taken a slight dip.

Tools operating in the U. S. last week totaled 2,495, a drop of 16 from the week before. Some 13 of those idled were in Texas.

A new state-by-state report on rig activity is starting on p. 383, as a regular Journal feature.

Exploration notes: A new American group, headed by Champlin Oil & Refining, has 870,000-acre concession in Panama and will drill within 6 months. Kerr-McGee and Southland Royalty also have 25 per cent interest in the deal... Western Canada's hottest reef play is taking place in Innisfail area, 60 miles north of Calgary. Nine rigs either are drilling or scheduled to begin operating soon... Big drilling play is expected to follow Utah's first Mississippian discovery at the Pure 1 Big Flat Unit.

Many geologists think the well is the forerunner of new fields in the area... Superior is moving both its Lake Maracaibo rigs east of its second successful wildcat to test further its 7,744-acre lake block... Loffland Brothers is sending equipment into the Gulf of Paria and plans to spud first wildcat by mid-October for combine headed by Conoco... Two American firms, Sinclair and Newmont Mining, have taken on French partners aiming at oil exploration in Algeria's Sahara desert.

Refiners now have more facts on the unwanted nitrogen compound in the crude they process.

This information emerged recently at American Chemical Society sessions: Nearly 20 per cent of all U. S. crude is high nitrogen. Removal of nitrogen either by acid or hydrogen treating pays in higher yields of better quality gasoline.

Refinery construction: Fluor will get the contract on Commerce Oil Refining Corp.'s new 43,000-bbl. refinery near Jamestown, R.I.... Look for announcement from Dow Chemical soon that it plans a second polyethylene plant at its Freeport, Tex., petrochemical center. Bids are going out for the plant now.

A new dynamiting technique has been developed to a high degree by H. C. Price Co. It may interest other pipeliners.

The method uses delayed explosion. The result is that vibration and throw of rock are held to a minimum. Key to the innovation is extensive exploitation of delays in the Primacord connections for detonating.

Price crews have used the technique in a big looping job for Texas Eastern Transmission in Kentucky. Blasting was carried on in the new ditch only 25 ft. from an existing, live big-inch line without damage (p. 124).

Trans-Canada finally is getting into the gas business.

It will sell first Alberta gas this week in Regina. Gas sales will begin in Winnipeg next week. First sales in Montreal will come by late 1958.

Going to lay a gathering line soon?

There are important savings in both investment and operating costs to be gained by using lightweight pipe with a modern thin-film coating.

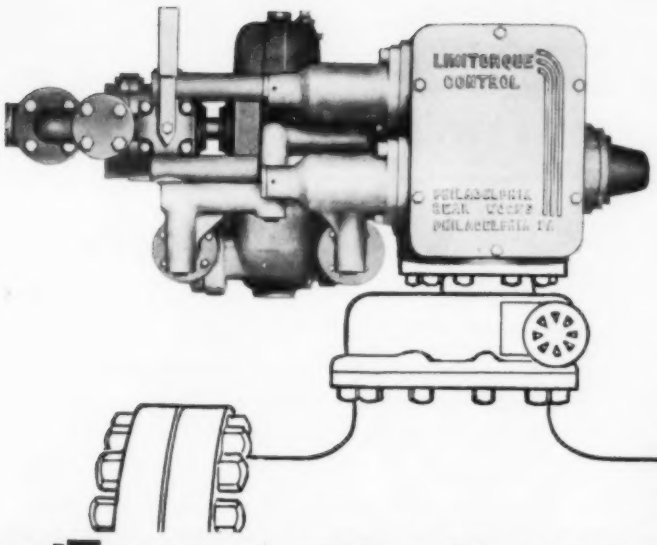
Thin-walled pipe has been used in trunk pipelines for 20 years. But not in smaller lines. Chief obstacle has been the pipe mills. Pipe makers are reluctant to roll lightweight because of low tonnages involved.

But with rising costs becoming such a factor, this trend may change (p. 130).

Esso Export has cut price on Middle East crudes lifted at Eastern Mediterranean ports by 10 cents a barrel.

The reason: Depressed tanker rates have been making liftings in the Persian Gulf more attractive.

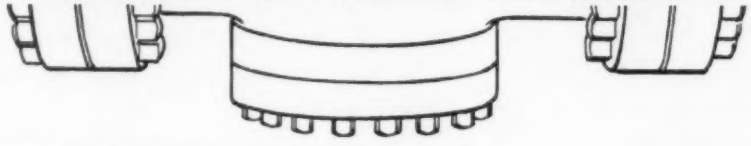
The cut makes 36.0-36.9°-gravity Arabian and Iraq crude now bring $2.59 f.o.b. Tripoli, Banias, and Sidon.



LimiTorque TYPE "GAS" VALVE CONTROLS

...feature the only true turbine design available

...provide dependable operation after extended shutdown



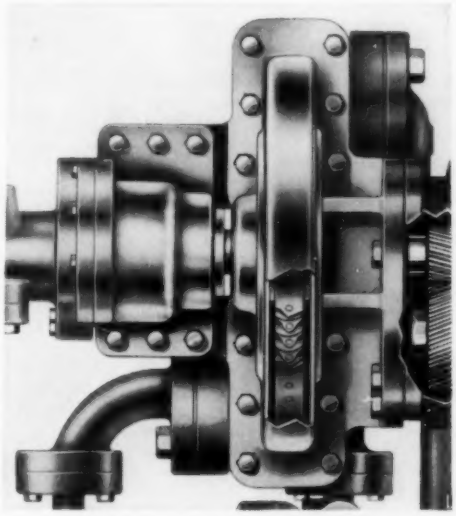
exclusive design features include:

- **Positive, simple overspeed control**
- **All internal parts of non-corrosive materials**

The type GAS valve operator introduces an entirely new concept into automatic mechanical valve operation. Here is a motorized operator for plug and gate valves especially designed for natural gas pipeline service. The single wheel turbine develops high torque at rated speeds and is designed to operate on natural gas at unreduced inlet pressures up to 1200 psi. The gas turbine eliminates serious friction wear at vane tips and possibility of damage due to excessive motor speeds. Being a true turbine, with permanently lubricated bearings, no line oiler or any other lubrication means is required.

In some sizes of gate valves the LimiTorque type GAS operator is top mounted, eliminating the expense of valve bevel gearing. A declutching mechanism disconnects the motor, allowing a complete checkout of the entire system. The turbine can be run without moving the valve or disturbing limit valve settings.

All operators are readily adjustable to packaged automatic shutdown systems, solenoid control and manual control through the use of four way valves. Electrical switches can be provided for remote light indication.



Cutaway shows unique single wheel turbine construction.

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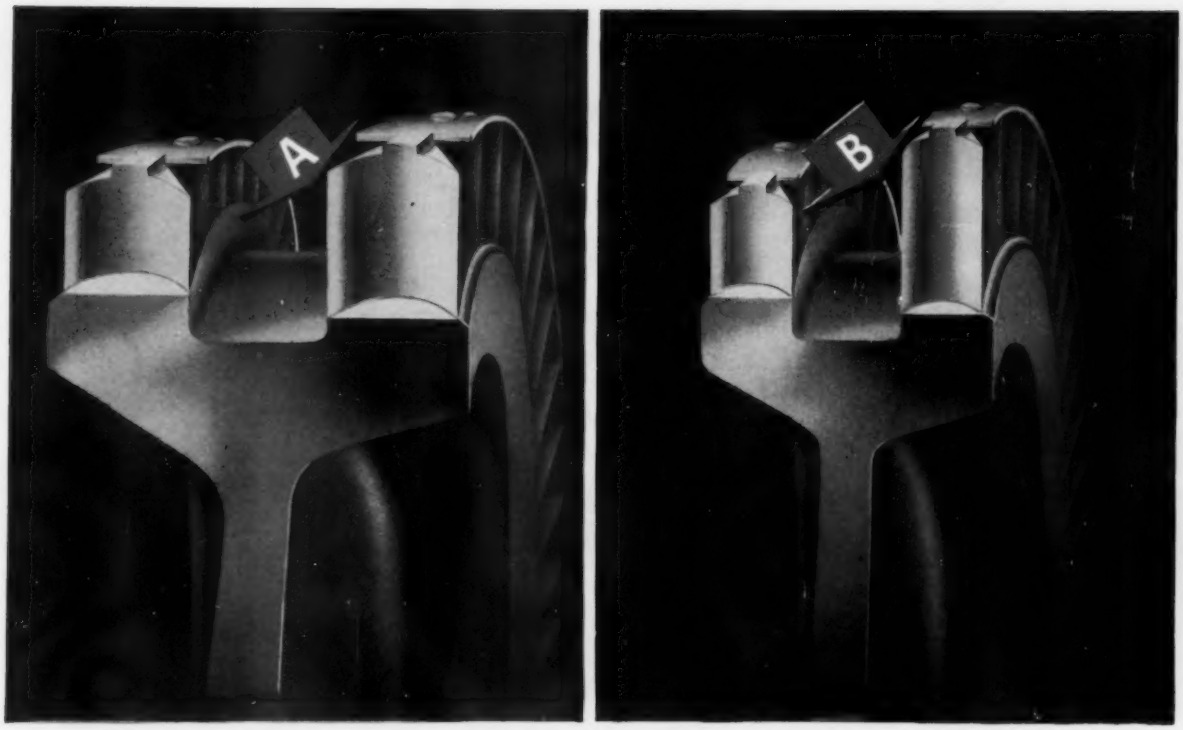

(Left, A) wide bucket "L" type wheel. (Right, B) regular type wheel for Coppus Steam Turbines

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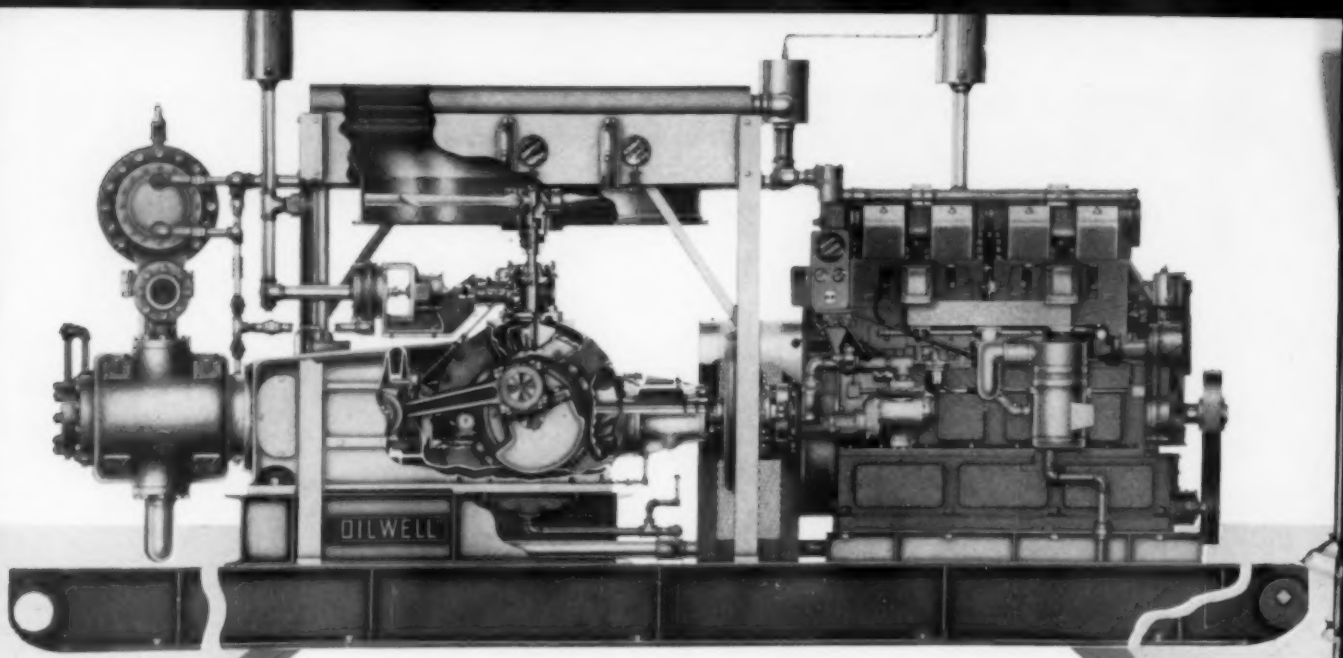

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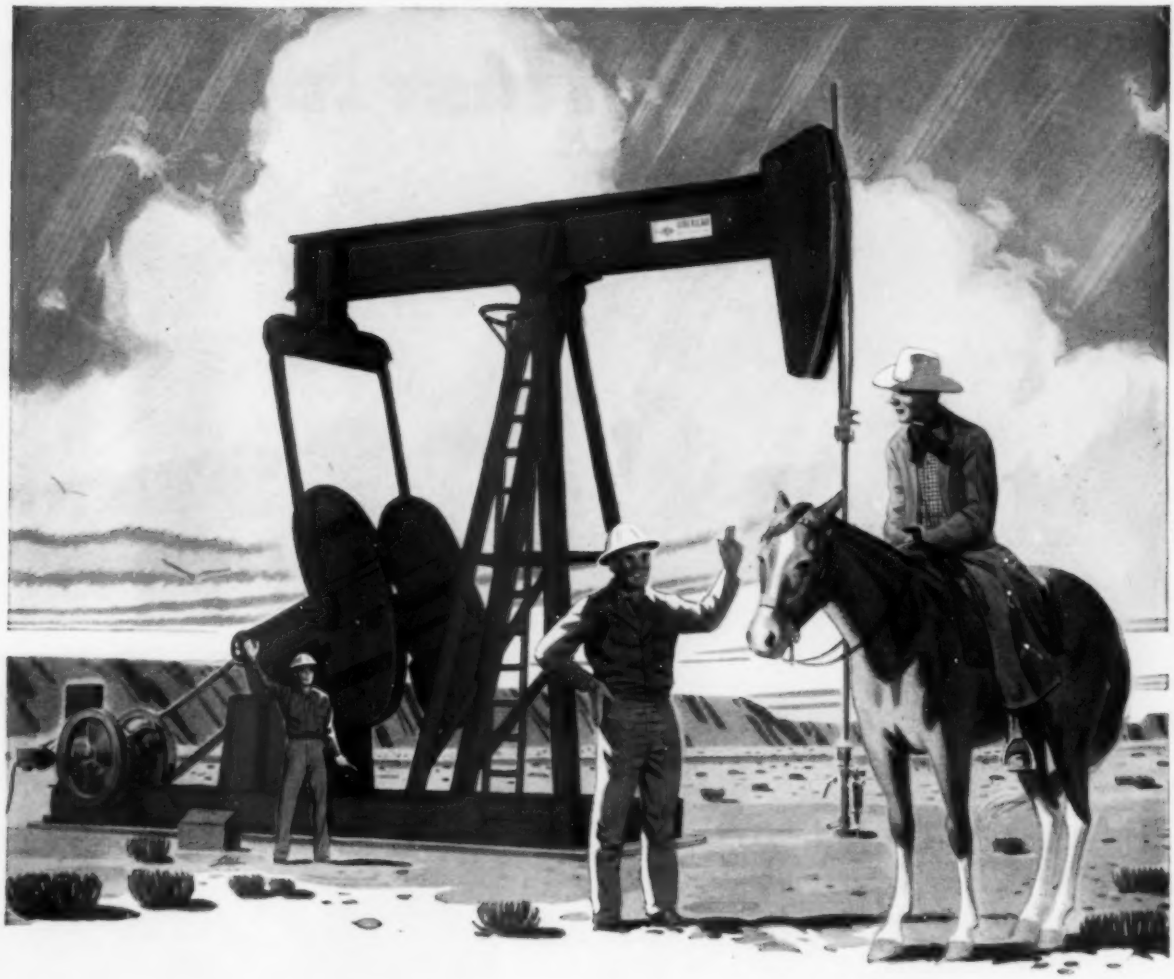

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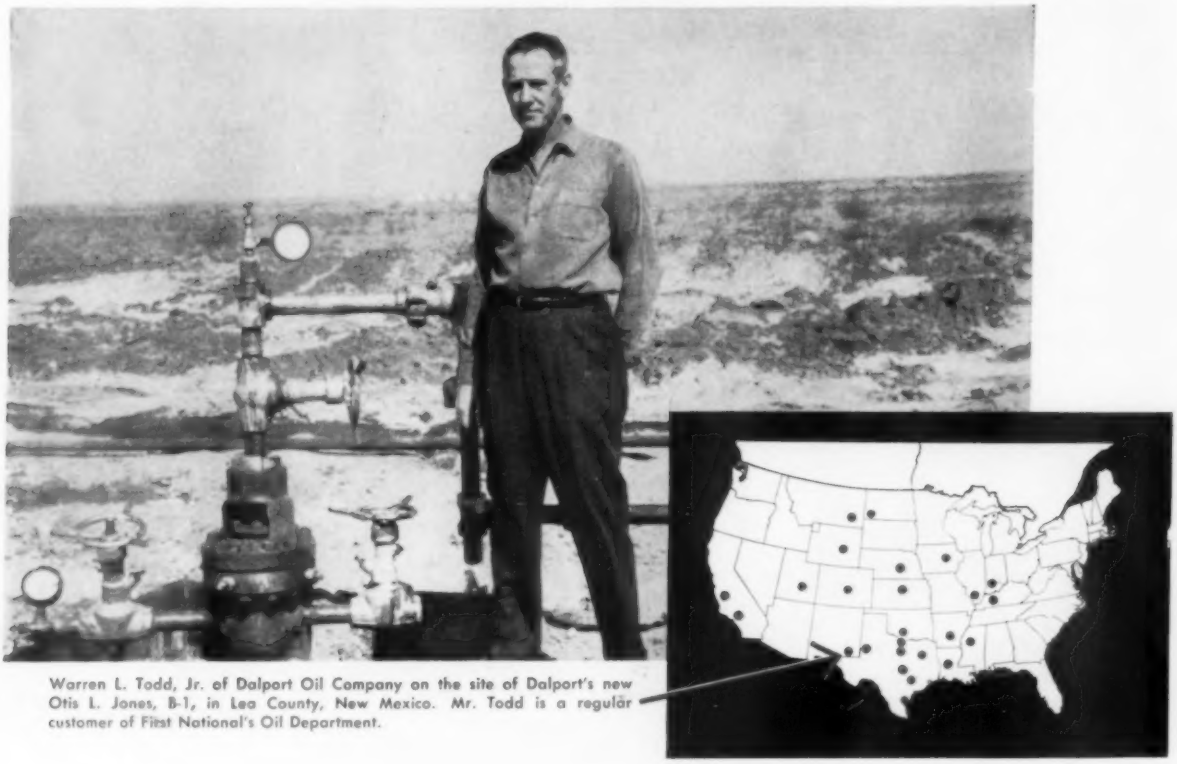

Warren L. Todd, Jr. of Dalport Oil Company on the site of Dalport's new Otis L. Jones, B-1, in Lea County, New Mexico. Mr. Todd is a regular customer of First National's Oil Department.

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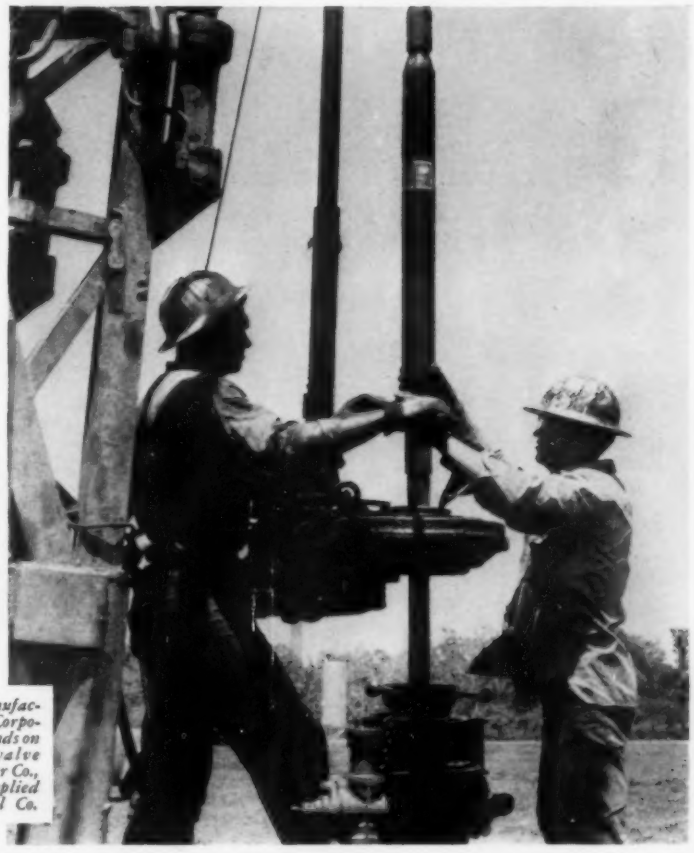

Type C Gas Lift Valve manufactured by Otis Engineering Corporation, Dallas, Texas, depends on Hycar sleeve and check valve produced by Murray Rubber Co., Houston, Texas. Hycar supplied by B.F.Goodrich Chemical Co.

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Reduce Maintenance and "Down-Time"

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New Mounting Flexibility with Plug-In Control Head
. . . Same Basic Unit can be Used for Front or Trunk Mounting

With the T-POWER radio, you are no longer restricted to one type of mounting. Install the complete radio, with drawer unit and plug-in control head, for under-dash mounting. For rear mounting the same basic drawer unit can be installed in the trunk and connected by cable to a dash-mounted control head. And—the same basic drawer unit can be interchanged with the equivalent Motorola Twin-V trunk mount radio models operated from a 12-volt negative ground source.

T-POWER radio is another example of Motorola's continuing leadership in the practical application of transistors in mobile radio. Other tested and proved transistorized products include the Dynamic Microphone and Power Voice Speaker.

Get all the facts.—Write now for literature with complete information.

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The WORKHORSE of the PIPE-LINERS!

HERE'S a machine you can put into ¾ yd. work and know you are going to get full ¾ yd. output from it. The Northwest Model 25 is built for the workhorse jobs. Machinery bases are rugged, heat treated alloy steel castings. Machinery side frames are cast integral with the rotating base casting. Realize what this means. It assures a lifetime permanence of shaft alignment. It eliminates weaving that is the direct cause of wear. There is nothing else like it!

You can go through the whole machine—Booms!—sturdier for workhorse digging and lifting. Uniform Pressure Swing Clutches!—cooler running, trouble free. The Helical Gear Drive!—running in oil, mounted on anti-friction bearings, free from the adjustments and stretching that come with chain drives. The "Feather-Touch" Clutch Control!—with the *feel of the load* free from the complications of delicate mechanisms, valves, pumps and tubing. The Cushion Clutch, a wide range of Boom Hoist Equipment to choose from, Easy Convertibility—These and many more advantages give you a piece of equipment with ability that you can't find anywhere else for handling the workhorse pipeline jobs.

This is the ¾ yd. machine you should investigate. A Northwest Man will fill in the details.

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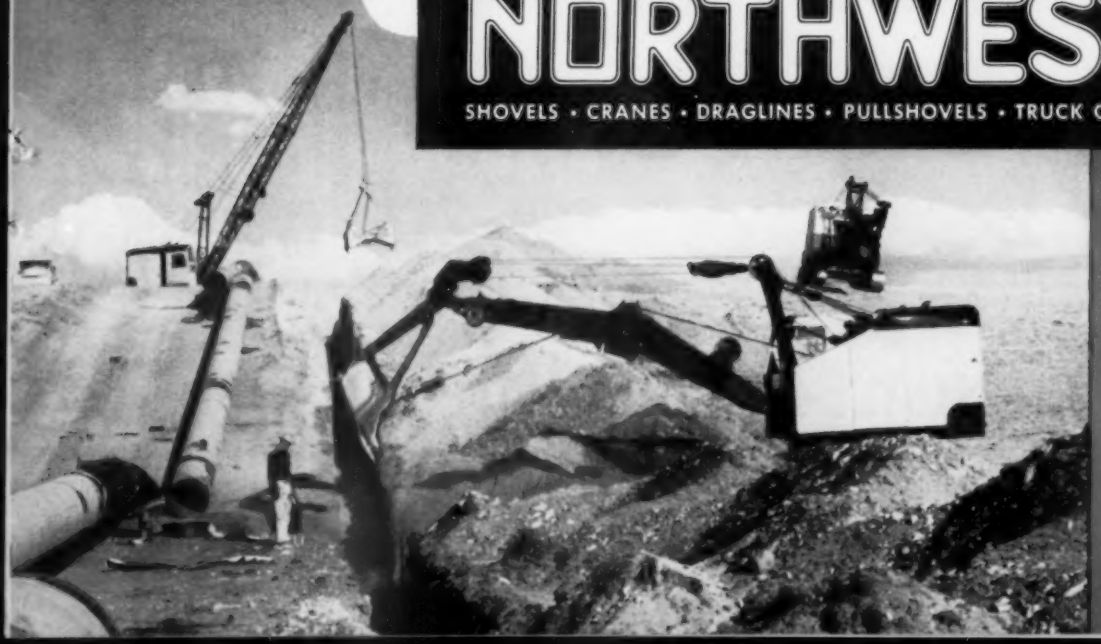

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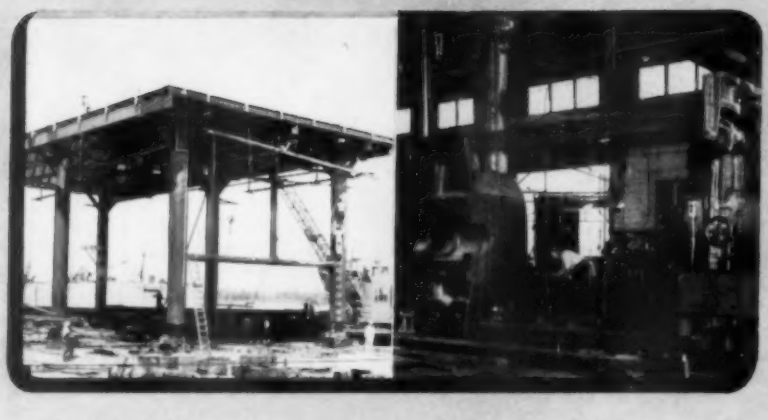

this is **AVONDALE'S** story

A map illustrates the fact . . . that in the fan-shaped riches of the Tidelands, there is one centrally-located point for construction and repair. That point is Avondale, with four major divisions compactly grouped in the New Orleans area. Moreover, Avondale has the facilities—the capacities—the special production tools required by offshore operations. For a small job —quick repair of a piece of drilling equipment—there is Avondale's enlarged Oil Field Machine Shop. For the design and construction of an elevated deck drilling barge—a big job in every sense of the word—there are Avondale's vast facilities at the River Plant. Yes, when you want the best and you want it fast, your nearest and most complete source is Avondale . . .

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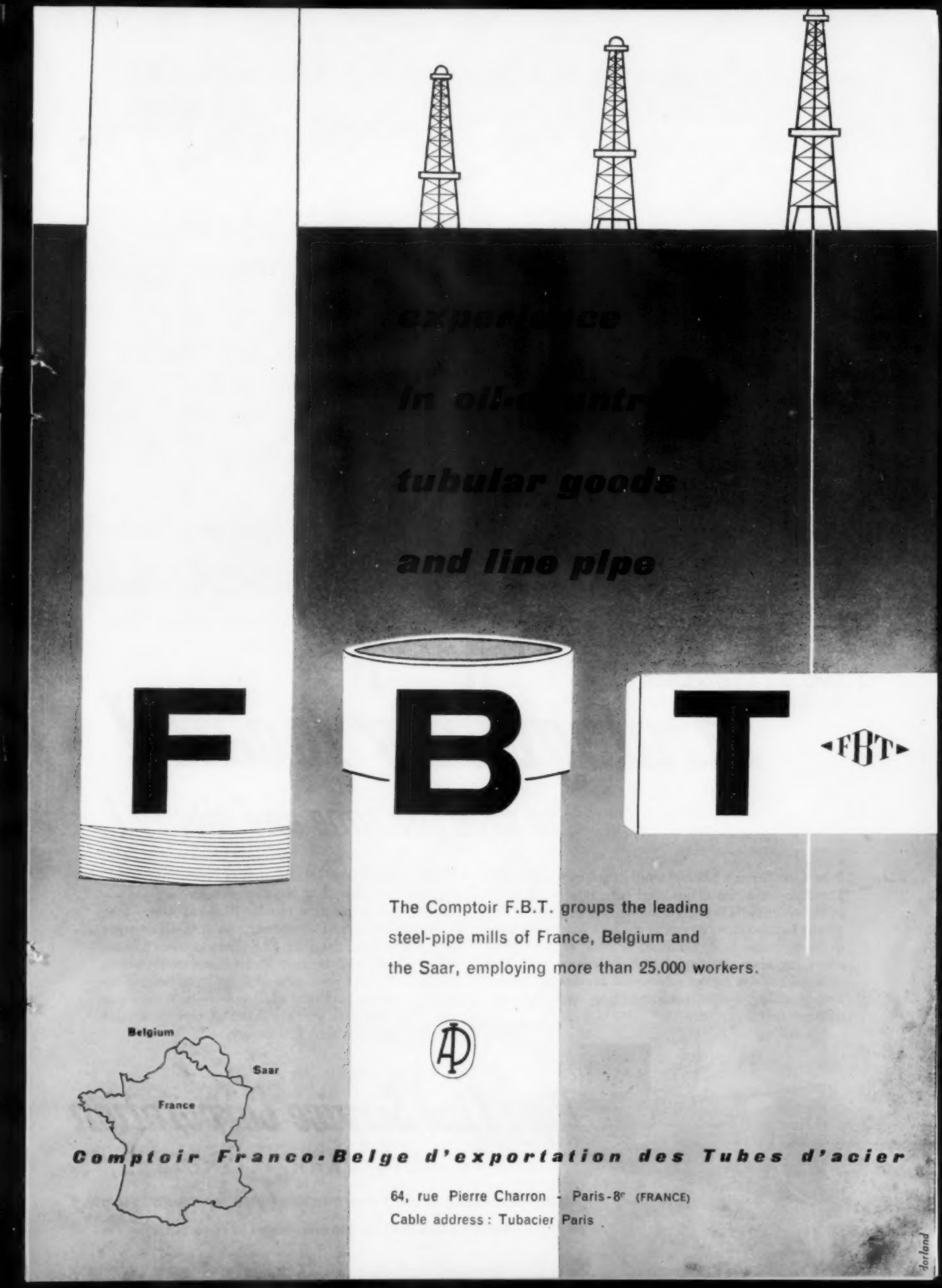

The Comptoir F.B.T. groups the leading steel-pipe mills of France, Belgium and the Saar, employing more than 25.000 workers.

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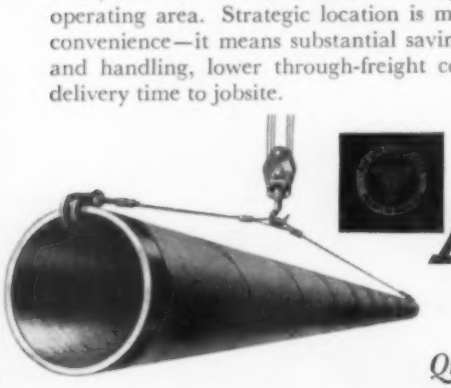
Pipe Line Service has eight fully equipped wrapping plants to serve the major steel pipe producing areas in the country! These eight modern plants are strategically located to serve you as the pipe leaves the tube mills, en route to destination, or at a plant in your operating area. Strategic location is more than just convenience—it means substantial savings in storage and handling, lower through-freight costs, and less delivery time to jobsite.

What's more, these plant locations mean that, wherever you buy your pipe, you can get a uniform coating and wrapping job at a nearby PLS plant—no long shipping delays. If needed, you can have pipe wrapped at more than one PLS plant, delivered to the same jobsite, and be sure there is no difference in quality. Call in your nearest Pipe Line Service representative on your next coating job—he'll show you how PLS can give you the finest in pipe protection and still save you time and money.



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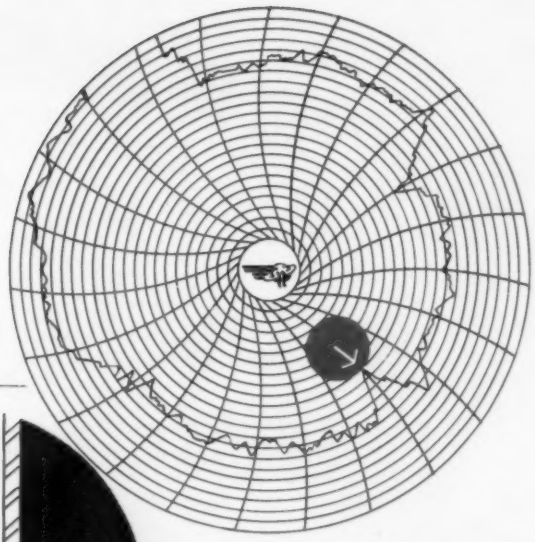
Quality pioneers in coating and wrapping pipe for a quarter century

There's a PLS plant strategically located to serve YOU!

now... hydrodynamic programming!



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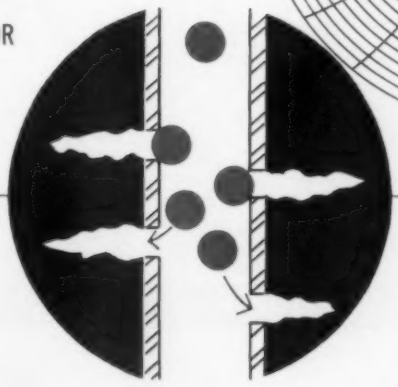

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PERFPAC IS MORE ECONOMICAL

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- In all types of formations.
- Through tubing, annulus or casing.
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Save time, tools and treating cost . . . Try Halliburton's new Perfpac Fracturing Service.

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251 SERVICE CENTERS — JUST MINUTES AWAY FROM ANY RIG

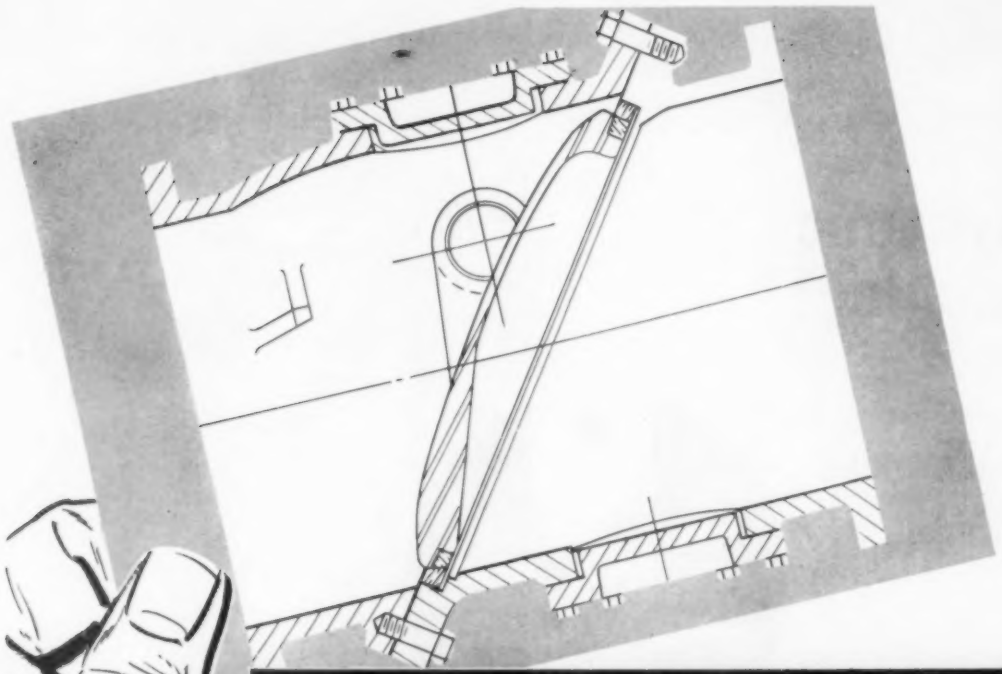


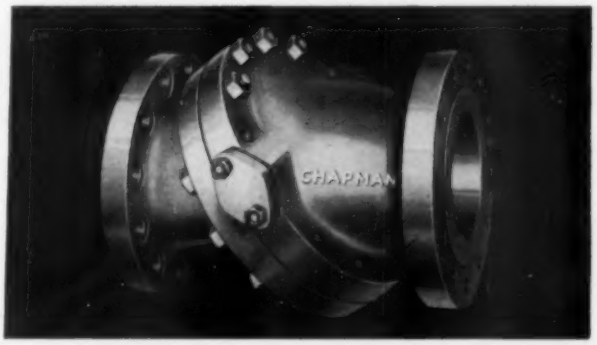
Diagram for quick, quiet, low-cost valve operation

Here's the picture . . . a cross section showing the working principles of the Chapman Tilting Disc Check Valve. It makes sense. It's a clear-cut diagram of a way to save dollars.

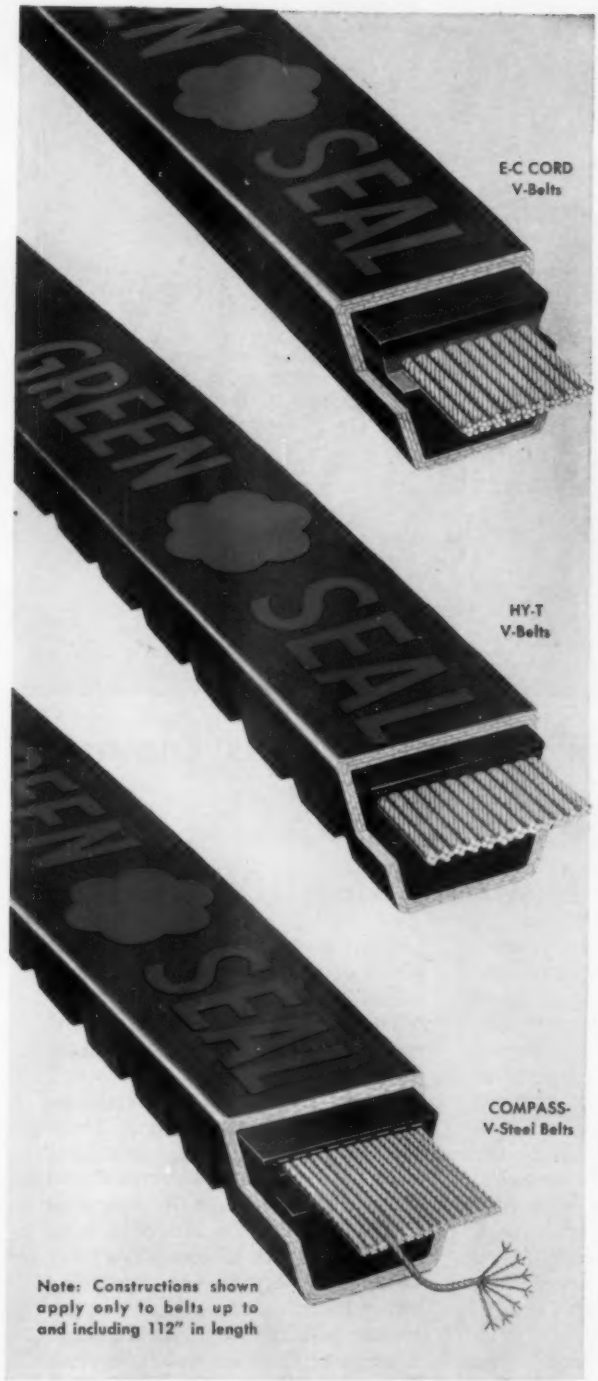
Notice the body design — plenty of room allowed to eliminate flow resistance, and the balanced "Airfoil" disc supported on a pivot. When the flow is on, disc opens wide enough to meet the demands of the flow. When the flow is off, disc drops quickly to a firm, tight seat. This is not only quick operation . . . it's quiet operation. There's no flutter. No banging. No slamming. No scraping of disc and seat. All this, of course, means low-cost operation. There's nothing to cause wear and tear or damage to valve or system. Your maintenance costs are low even under severe conditions.

CHAPMAN
Tilting Disc Check Valve

For best results in handling fluids or gases at the lowest cost, specify Chapman Tilting Disc Check Valves. They cover a wide range of pressures and are available in iron or steel. You'll find them all with complete data in our Catalog 30-A. Write for your copy, now.



The CHAPMAN
Valve Manufacturing Co.
INDIAN ORCHARD, MASSACHUSETTS



Why V-Belts with the Green Seal?

The Green Seal is put on each Goodyear multiple V-Belt for *your* protection. For it's your sign of a belt with dimensional stability—something long sought but only recently achieved in a complete line of V-belts.

What does dimensional stability mean to you? It means belt length remains the same from factory to drive. The length you order is the length you get. Matched sets stay matched. And mismatching — the biggest problem in belting multiple drives — is now a thing of the past.

How was this dimensional stability achieved? Until recently, stable belt length was possible only with steel cable load carriers as developed by Goodyear. But now it is also accomplished with synthetic cord through the exclusive Triple-Tempered 3-T process that stabilizes length by careful tempering with Tension, Temperature and Time.

Triple-Tempering also gives you a stronger, more shock- and stretch-resistant belt. Add "balanced construction" — with each component of the belt designed to its job—and you have a smoother-, longer-running belt which means maximum, trouble-free horsepower hours at minimum cost.

DIMENSIONALLY STABLE V-BELTS
with the GREEN SEAL by

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THE GREATEST NAME IN RUBBER

The Goodyear Tire & Rubber Company, Dept. 794, Akron 16, Ohio

Please send me more information about how V-Belts with the Green Seal solve the major problem in belting multiple V-belt drives.

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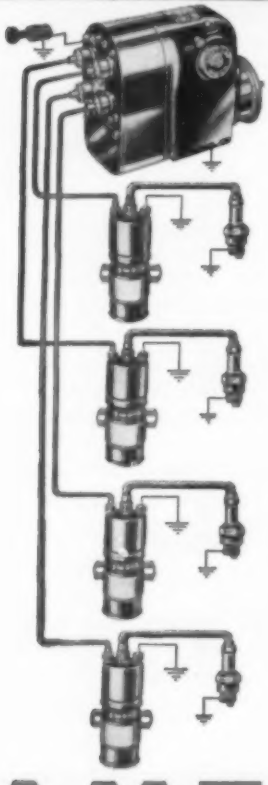
Compass, E-C Cord, Hy-T, Green Seal—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio



for Large Bore Stationary Gas Engines

AMERICAN BOSCH

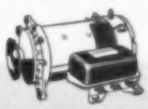
LOW TENSION MAGNETO IGNITION SYSTEM

The System comprises the American Bosch MRB Low Tension, shielded Magneto and individual High Tension Ignition Transformers mounted at each engine cylinder. (See 4 cyl. installation diagram at left). Low tension current, generated in the Magneto, is distributed through low tension leads to the Transformers. Here, the electrical energy is stepped-up to high voltage and conducted to the spark plugs by short cables—shielded if desired. The rugged, heavy-duty, high tension Transformers (as illustrated above) are available with or without shielding for use in the American Bosch System or other low tension systems employing magneto or battery ignition.

Energy losses and corona effects which occur with long high tension cables are eliminated. The possibility of fire and explosion hazard is minimized where engines operate in combustible vapors . . . radio and TV interference may be greatly reduced by complete shielding. These important advantages, combined with the outstanding electrical and mechanical features of the American Bosch Low Tension Magneto, offer maximum spark efficiency for large bore, stationary engines operating under severest conditions. For peak engine performance and safer, continuous service, get the facts from American Bosch, Springfield 7, Mass. A Division of American Bosch Arma Corporation.

AMERICAN BOSCH

Automotive and Aviation Magnetos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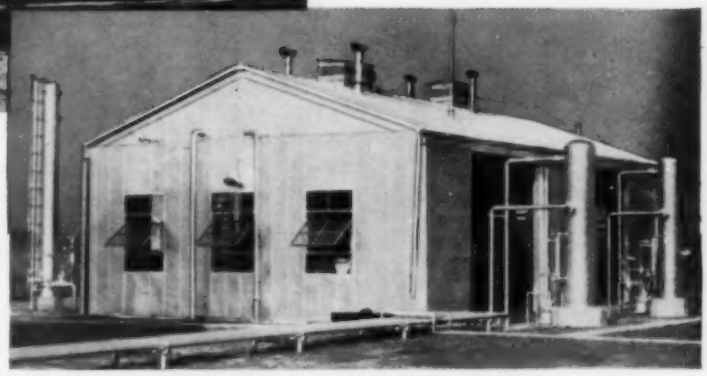

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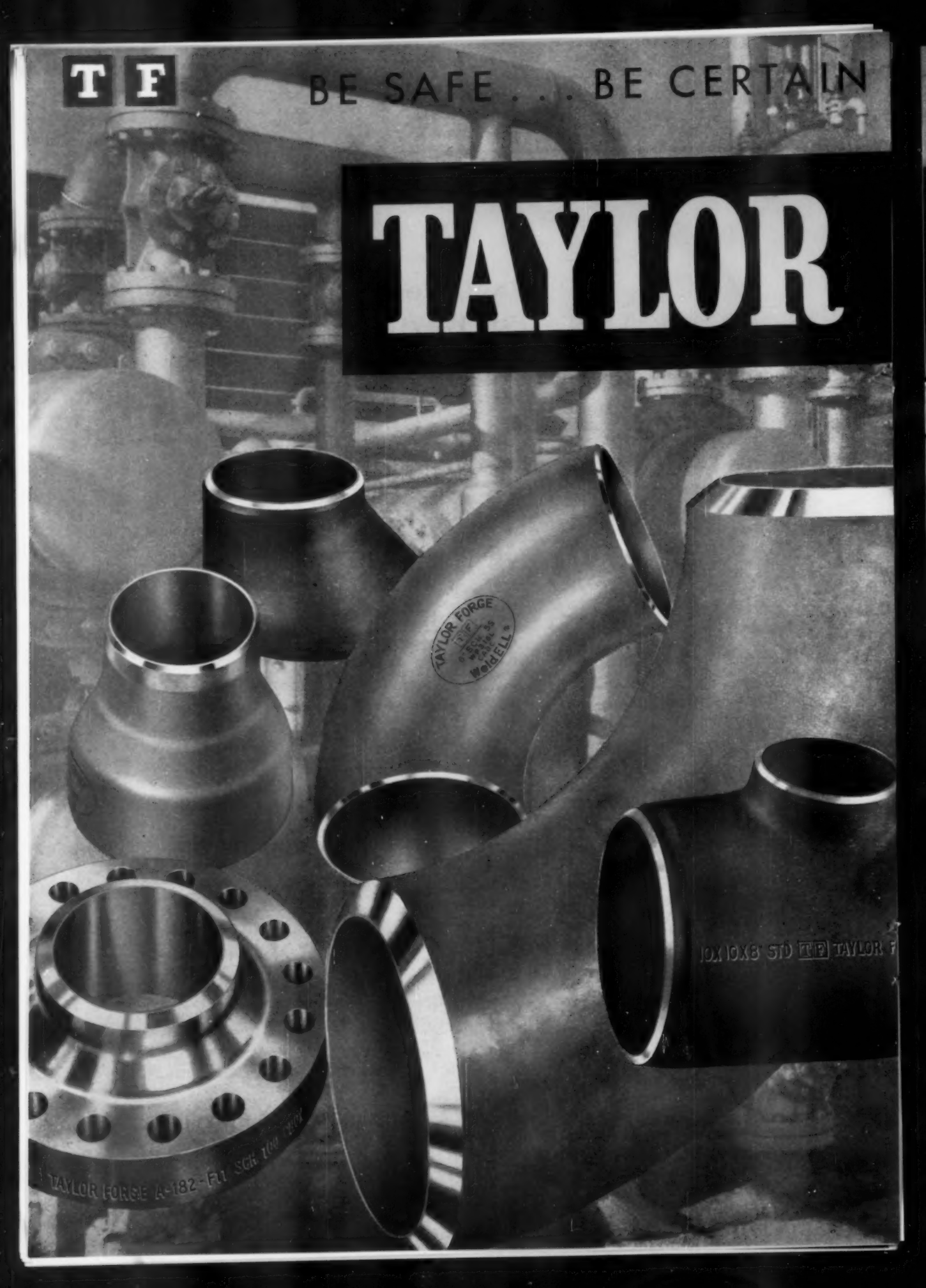
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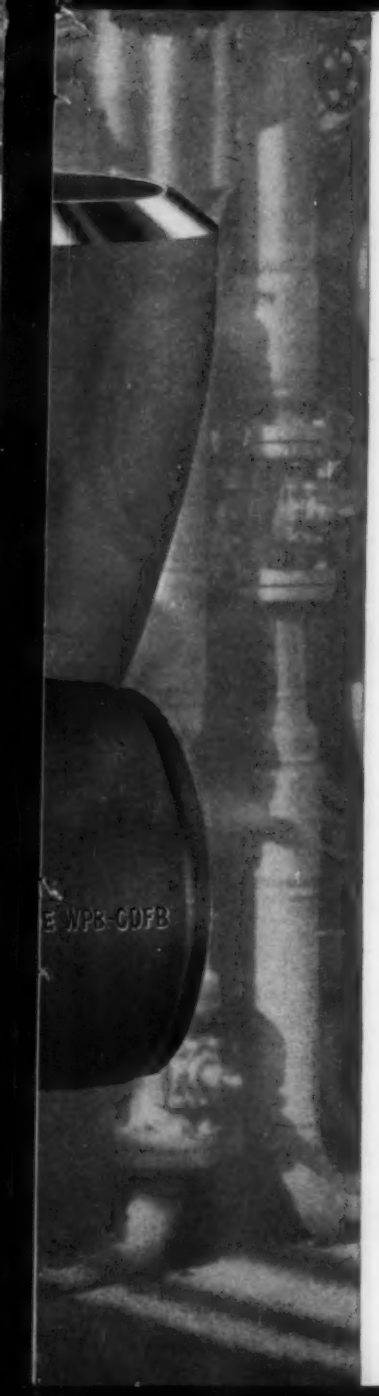

Whether it's a *Carbon Steel* Tee for some ordinary service or an *Alloy Steel* Flange for a high pressure-temperature application . . . whether it's a light wall Stainless Steel WeldELL for corrosion resistance or an extremely heavy one for the most critical nuclear power plant . . . whatever it is you can be safe . . . certain . . . confident . . . if it's made by Taylor Forge. For that name and this marking [T] [F] appear only on products for piping and pressure vessel construction that are truly

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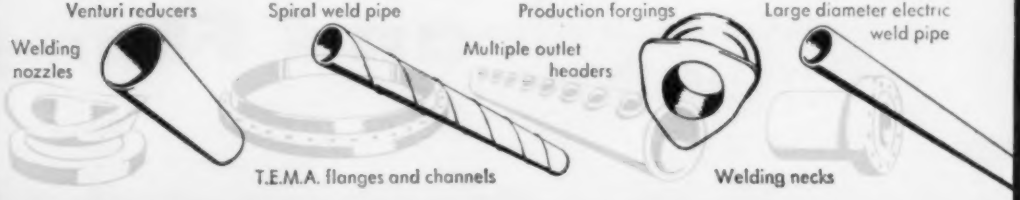
Call your Taylor Forge Distributor *For prompt, efficient service on the complete Taylor Forge line of Welding Fittings and Forged Flanges, patronize your local Taylor Forge Distributor.*



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...because they are drop forged by Vogt

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Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

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INSTALL IT... FORGET IT!

EASY-TO-MAINTAIN G-E TRI 55 CLAD MOTORS LAST LONGER

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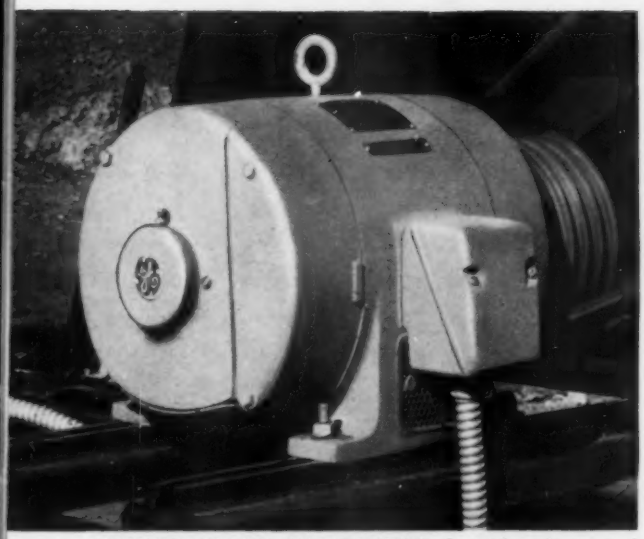
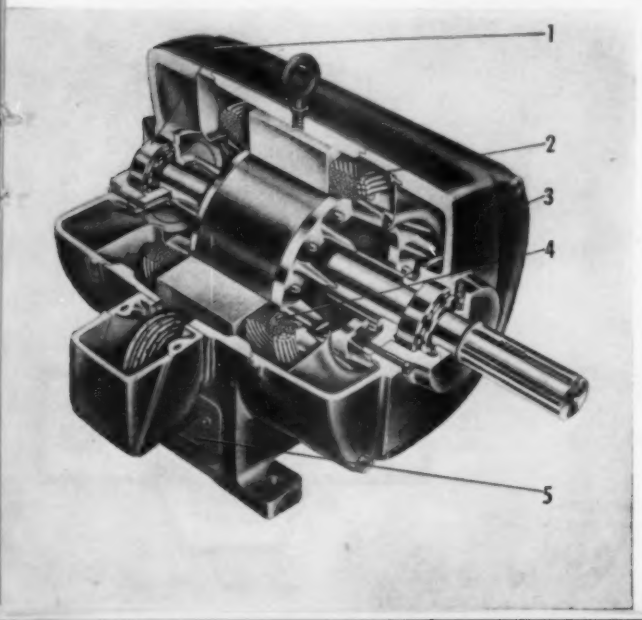


GREATER RIGIDITY AND STRENGTH of cast-iron frame and end shields prevent motor from being twisted out of line. Integrally cast ribbing on underside adds extra support.



General Electric's all-new Tri-Clad '55' oil field motor is specifically designed for long-life, easy-maintenance operation on your pumping applications. Protected against burnouts, dust and moisture, the new motor will run far longer without attention than ordinary motors.

Burnout protection for longer life—Burnouts are virtually eliminated with new Class 'B' insulation system utilizing Alkenex® heat-resistant wire enamel, and mica-glass laminate slot and phase insulation. This new system allows up to 40% higher temperature rise, yet extends motor life.

Advanced bearing system for easier maintenance—Under normal operating conditions, the advanced bearing system will operate longer without regreasing than any other motor bearing system. Effective seals on both sides of bearing housing keep grease in and dirt out, giving you all the service the long-lasting lubricant can deliver. Large grease reservoir *reduces maintenance to a few minutes every 5 years*. Pipe plugs on bearing housing permit regreasing even when motor is operating.

Greater physical protection for outdoor service—The new Tri-Clad '55' motor is built to take the weather. End shields and frame are rust-resistant cast iron. The insulation system virtually eliminates breakdown due to moisture. Air vents are protected, and removable screens guard against animal and rock damage.

Complete information available locally—For full details on the easy-to-maintain, long-life Tri-Clad '55' oil field motor, contact your local G-E motor distributor or your nearby General Electric Apparatus Sales Office. General Electric Company, Schenectady 5, N. Y. 899-1

CHECK THESE YEARS-AHEAD FEATURES

1. Advanced bearing system will last longer without regreasing than any other bearing system.
2. Water-shedding stator windings virtually eliminate breakdown due to moisture.
3. Rugged cast-iron frame helps prevent rust and accidental damage.
4. Class 'B' insulation system with revolutionary Alkenex® wire enamel allows up to 40% higher temperature rise . . . yet extends motor life.
5. Removable screens protect G-E oil field motors against damage from rodents and rocks.

Progress Is Our Most Important Product

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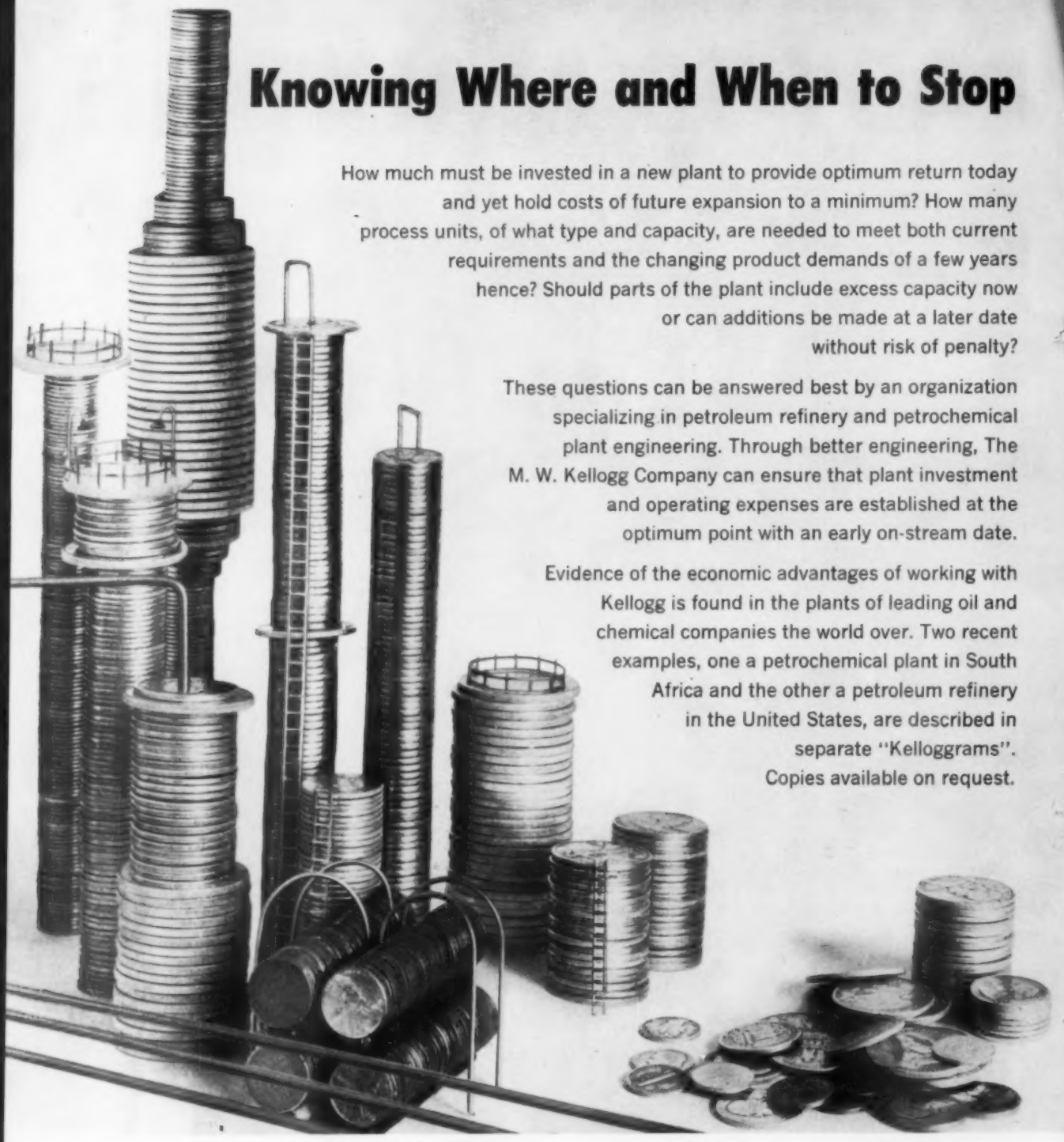

Knowing Where and When to Stop

How much must be invested in a new plant to provide optimum return today and yet hold costs of future expansion to a minimum? How many process units, of what type and capacity, are needed to meet both current requirements and the changing product demands of a few years hence? Should parts of the plant include excess capacity now or can additions be made at a later date without risk of penalty?

These questions can be answered best by an organization specializing in petroleum refinery and petrochemical plant engineering. Through better engineering, The M. W. Kellogg Company can ensure that plant investment and operating expenses are established at the optimum point with an early on-stream date.

Evidence of the economic advantages of working with Kellogg is found in the plants of leading oil and chemical companies the world over. Two recent examples, one a petrochemical plant in South Africa and the other a petroleum refinery in the United States, are described in separate "Kelloggrams". Copies available on request.

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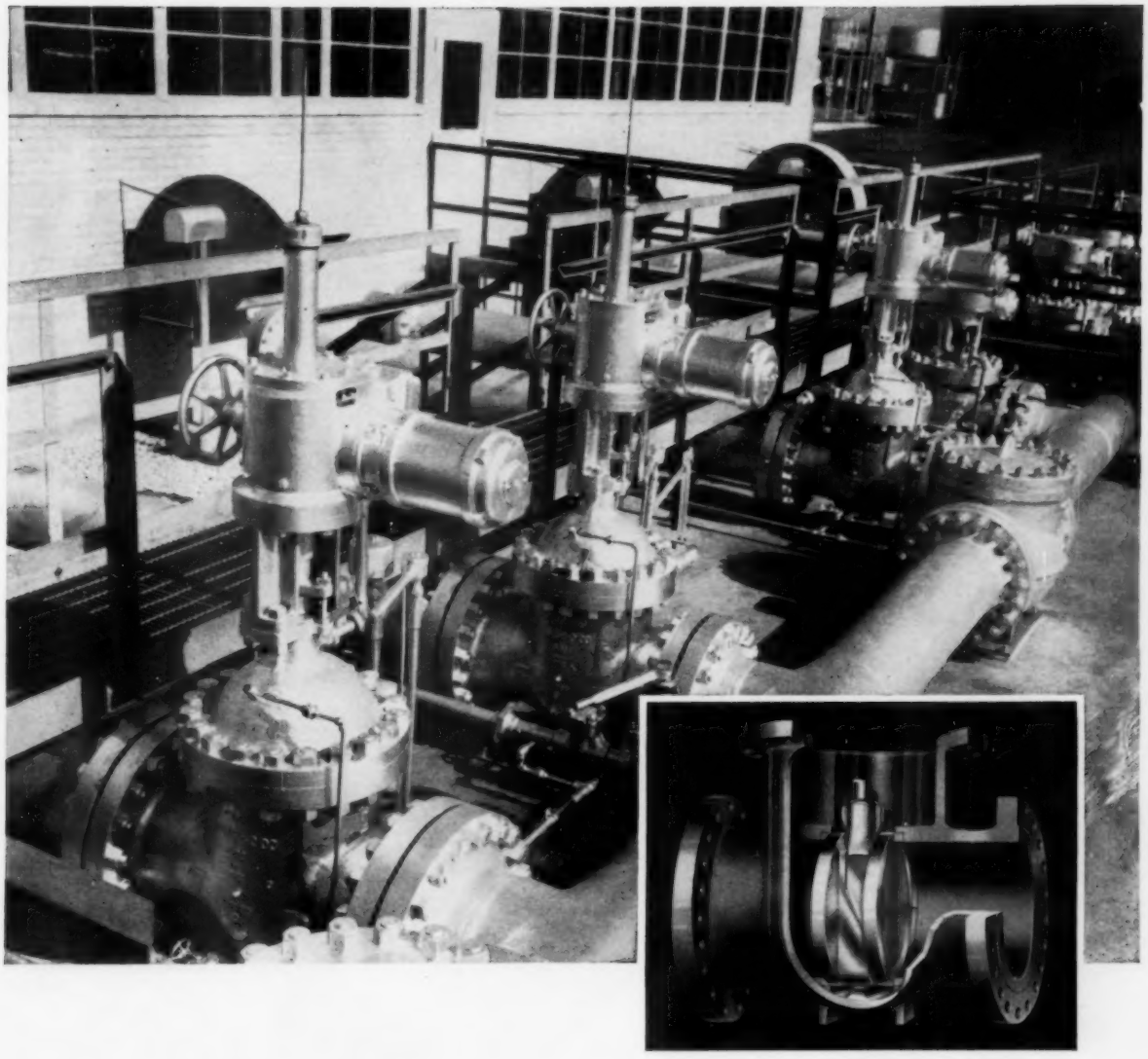


Why Darling revolving double disc gate valves mean . . .

permanent good behavior!

THE reason is very simple. These valves are different! They were designed with one objective uppermost—to be uneffected by the very conditions that lead to trouble in ordinary gate valves. And so it was that Darling came up with the fully revolving double disc, parallel seat principle. It minimizes friction and avoids wear concentration. It assures remarkably easy operation with self adjustment for positive closure. It automatically compensates for any valve body deflection.

The proved result is that these Darling valves consistently show superiority in service life, low maintenance, positive operation and trouble-free performance. Savings naturally result. Write for Catalog No. 57.

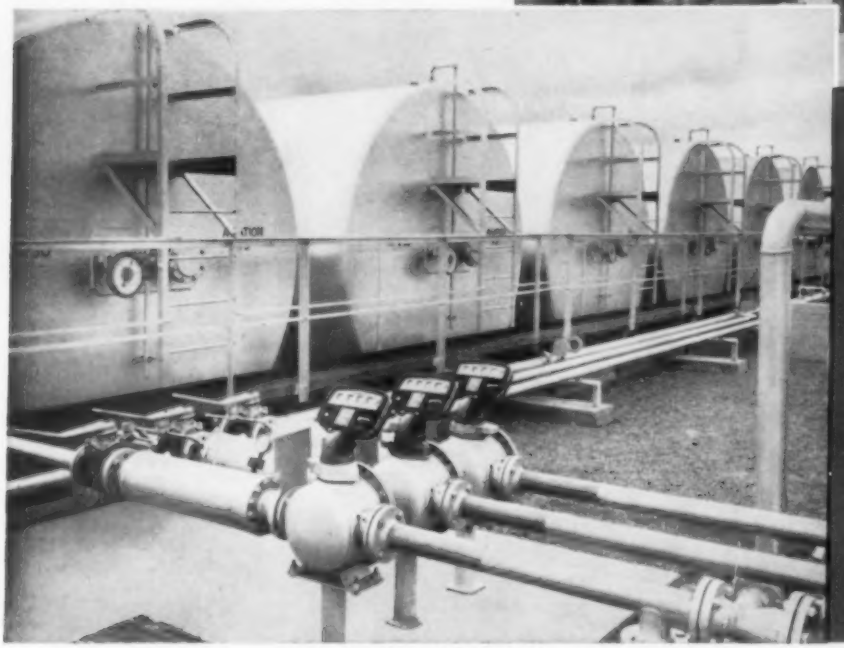
DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 1, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

BRODIE pipeline meters record millions of gallons of aircraft fuel pumped to "satellite" storage



45° Angle Adaptors provide full visibility of the easy-to-read Brodimatic Counters from all operating and control positions.

Each of three *BiRotor* Meters is manifolded to two "satellite" storage tanks which supply loading racks for delivery through four additional *BiRotor* Meters to tank truck refuelers.

From Shell's main storage at the barge terminal two miles away, fuel is pumped daily to six "satellite" tanks at San Francisco International Airport. Three Brodie *BiRotor* Meters provide accurate records of every gallon received, simplifying control of input.

In critical services of this type, the sustained accuracy and low maintenance of *BiRotor* Meters is important. For only *BiRotors* offer the vibration-free, friction-free performance of true rotary operation with just two moving parts and no metal-to-metal contact in the measuring chamber. Ruggedness of double-case construction with welded steel housing give extra margins of safety. Accessible unit-built assemblies allow fast inspection, cleaning, service or replacement without disturbing line connections. Whatever your metering needs, consult your Brodie Metering Specialist today.

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BRODIE BiRotor METERS

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This 240,000-pound steam drum, built by Combustion Engineering for a large generating plant, is here being hoisted 120 feet into position by strong wire rope. It's a striking example of how . . .

safety rides on quality wire rope

You may never hoist loads as large as this 120-ton drum. But *safe, top quality wire rope is just as important to your own operations.* For, although the price of a "bargain" rope would be less, failure of such a rope could cost you thousands of dollars in wrecked equipment. Don't be a victim of false economy. Buy a wire rope that's a quality rope—buy Wickwire Rope.

5339

WICKWIRE ROPE · A CF&I PRODUCT

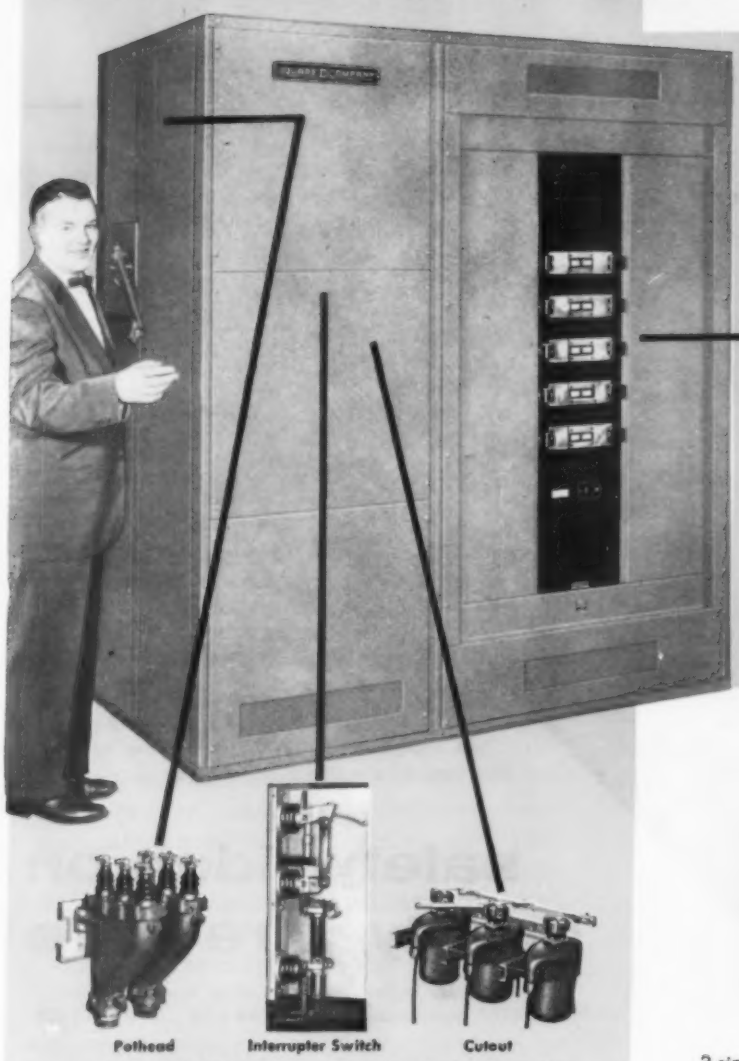
CF&I

LOOK FOR THE YELLOW *TRIANGLE*

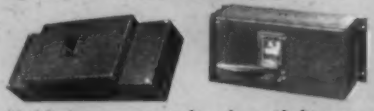
PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

THE COLORADO FUEL AND IRON CORPORATION—Albuquerque • Amarillo • Billings • Boise • Butte • Casper • Denver • El Paso Farmington (N. M.) • Fort Worth • Houston • Kansas City • Lincoln (Neb.) • Odessa (Tex.) • Oklahoma City • Phoenix • Pueblo Salt Lake City • Tulsa • Wichita • **PACIFIC COAST DIVISION**—Los Angeles • Oakland • Portland • San Francisco • San Leandro Seattle • Spokane • **WICKWIRE SPENCER STEEL DIVISION**—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) New Orleans • New York • Philadelphia

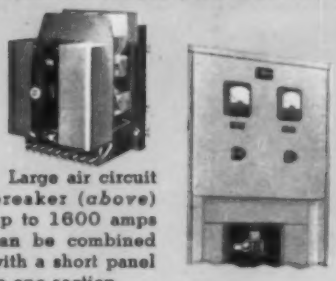
SQUARE D's NEW Unit Substation IN POWER-STYLE CONSTRUCTION



Designed to match Square D's Power-Style switchboards and control centers, these new Unit Substations meet NEMA, ASA, and AIEE standards. Available from 75 to 500 KVA; in primary voltages up to 4800v; secondary up to 600v.



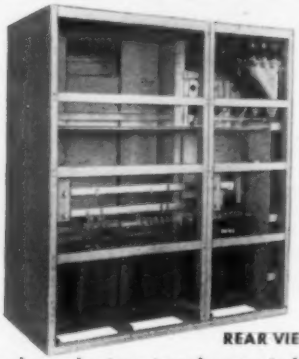
Molded case circuit breakers (*left*) up to 800 amperes and QMB Saflex fusible switches (*right*) up to 600 amperes are available in compact panel construction.



Large air circuit breaker (*above*) up to 1600 amps can be combined with a short panel in one section.

Pothead | Interrupter Switch | Cutout

Potheads, fused or unfused load break air-interrupter switches and fused or unfused oil-filled cutouts are available. Air-interrupter switches and cutouts are easily accessible from front of Substation.

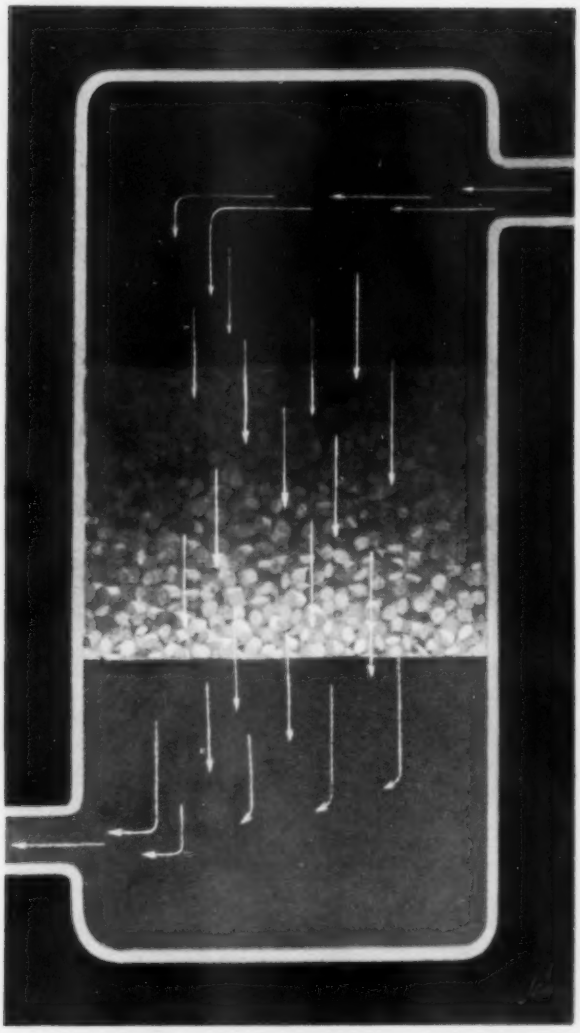


REAR VIEW

3 single phase, dry-type transformers individually mounted on base in ventilated enclosure—heating and vibration held to a minimum. Transformers easily accessible for maintenance and inspection. When no air circuit breaker or metering equipment is used, entire area at top left is available for pull box.

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY



New AERO* HDS-2 Catalyst

Unequaled in Efficient, Economical Feedstock Upgrading

New Cyanamid AERO HDS-2 extruded catalyst squarely meets modern hydrogen desulfurization requirements, featuring highest activity with low bulk density. Extensive laboratory and field performance data shows greater sulfur and nitrogen removal efficiency than other cobalt-molybdena types. Add the fact that the low bulk density of AERO HDS-2 gives up to 40% greater naphtha-treating capacity per pound of catalyst and you can see why it's the best buy for *your* hydrodesulfurization process.

Considerable performance data with reformer feed naphthas is already available on this outstanding product from another brand-new Cyanamid catalyst plant. This information will be glady supplied by your Cyanamid man. Write or phone him today.

*Trademark

HIGHLY SELECTIVE PLATINUM CATALYSTS

For normal or HDS-upgraded feedstocks, AEROFORM® Platinum Reforming Catalysts provide excellent performance in octane improvement. Good stability and easy regeneration contribute to their low cost-per-barrel.

TOP ANTI-WEAR FOR TOP LUBES

Where *extra* protection is required for engine break-in, AEROLUBE® 93-C concentrated zinc dithiophosphate does the job. Excellent oxidation inhibition and anti-wear properties make it ideal for both initial fill and regular use in premium oils.

The invaluable experience and advice of operating oil men is sought by Cyanamid's field men — is fed into our thoroughly modern laboratories — and results in superior, highly effective Cyanamid products. That is why each is so well suited for its recommended application.

CYANAMID

AMERICAN CYANAMID COMPANY, REFINERY CHEMICALS DEPARTMENT
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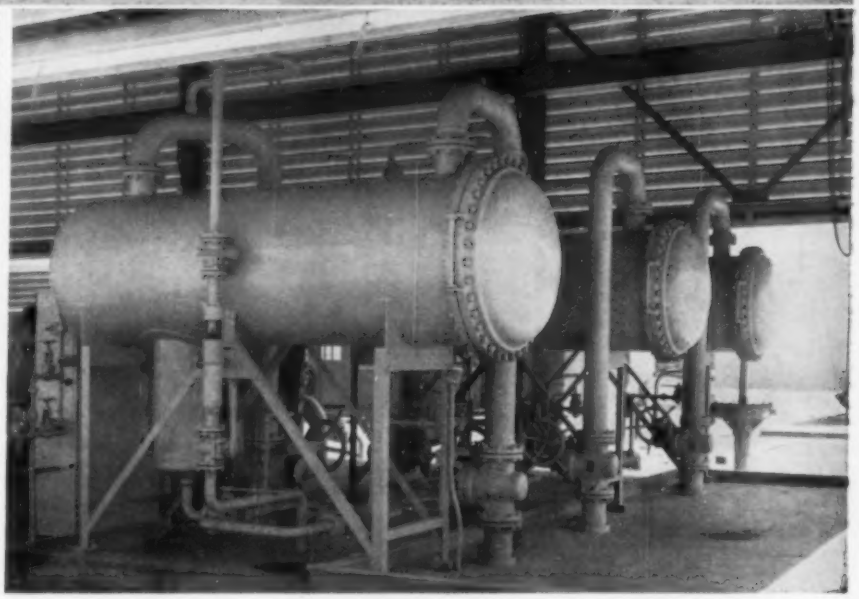
SOUTHERN PACIFIC PIPE LINES, INC.

select EXCEL-SO

water separators and meter calibrating tanks*



WARNER LEWIS COMPANY

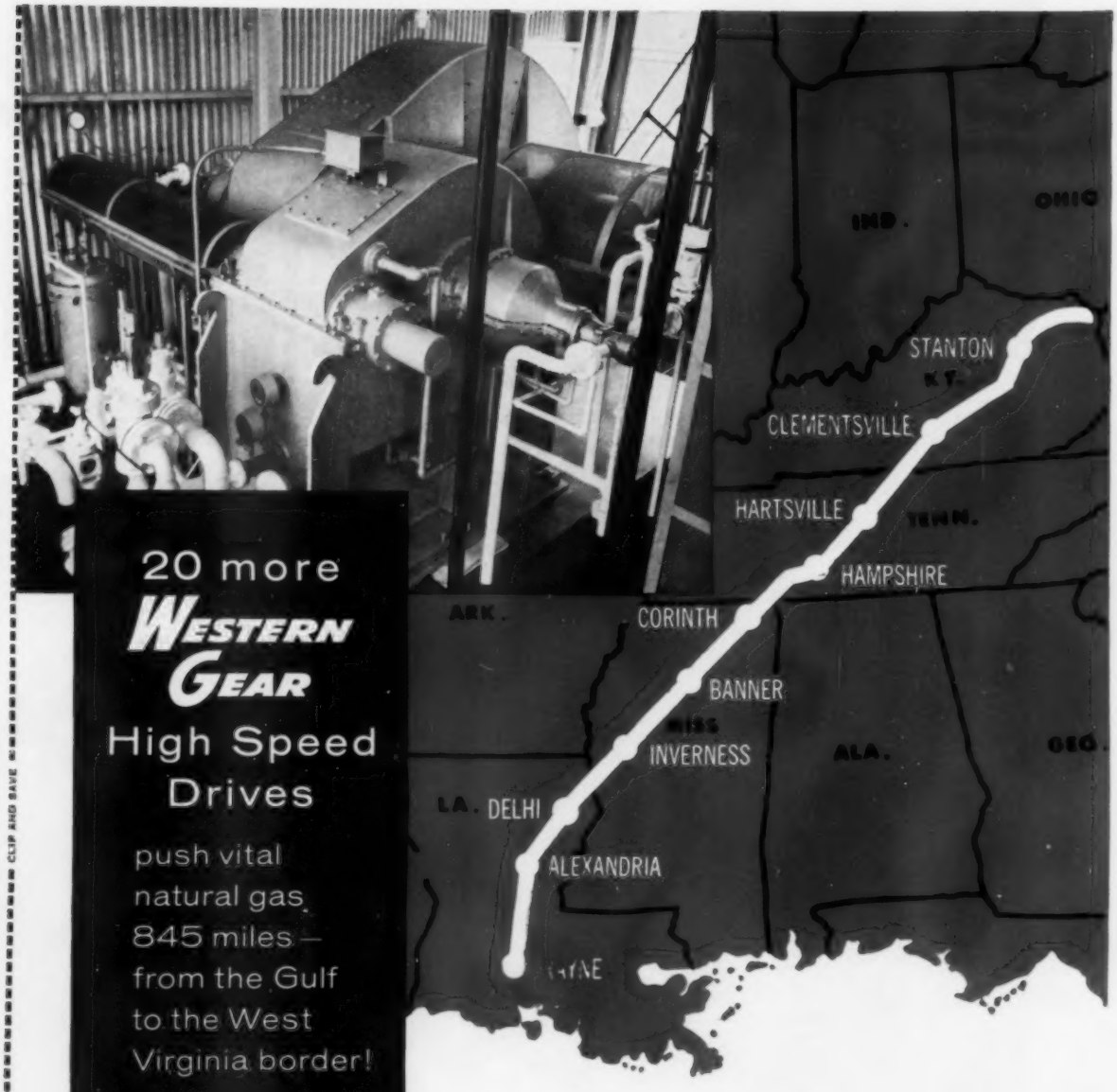
BOX 3096 • TULSA, OKLAHOMA

DIVISION OF FRAM CORPORATION

**These two famous EXCEL-SO pipeline products insure maximum product cleanliness and meter accuracy— eliminate costly corrosion and meter repairs*

High volume strainer/separators and large capacity meter calibrating tanks for a complete range of petroleum products—all in high pressure design where required—a specialty with the Warner Lewis Company. Years of experience in design and fabrication of this equipment for pipeline service are available for assistance in planning your installation. Write Warner Lewis Company for further information.

Representatives in all major cities
In Canada, Fram Canada Ltd.
Stratford, Ontario



CLIP AND SAVE

20 more WESTERN GEAR High Speed Drives

push vital natural gas 845 miles — from the Gulf to the West Virginia border!

Twenty additional two-stage Western Gear high speed units are now being delivered to Gulf-Interstate Gas Company for the expansion of its 845 mile, 30 inch main pipeline to increase its capacity to 575 million cubic feet daily. The outstanding success of its first remote controlled satellite station at Stanton, Ky., has attracted the attention of the industry to this significant Gulf-Interstate development. Western Gear engineers were called upon to design a two-stage high speed gear drive to step up the 5000 H.P. natural gas operated 16 cylinder Cooper-Bessemer engine to power a centrifugal compressor at 6,055 RPM. Western Gear salutes Gulf-Interstate for its achievement and stands ready to assist other forward-looking companies in solving their mechanical drive problems. Experience gained since 1888 assures efficient and reliable performance of Western Gear designed equipment. For assistance write Western Gear Corporation, General Offices, P.O. Box 182, Lynwood, California.

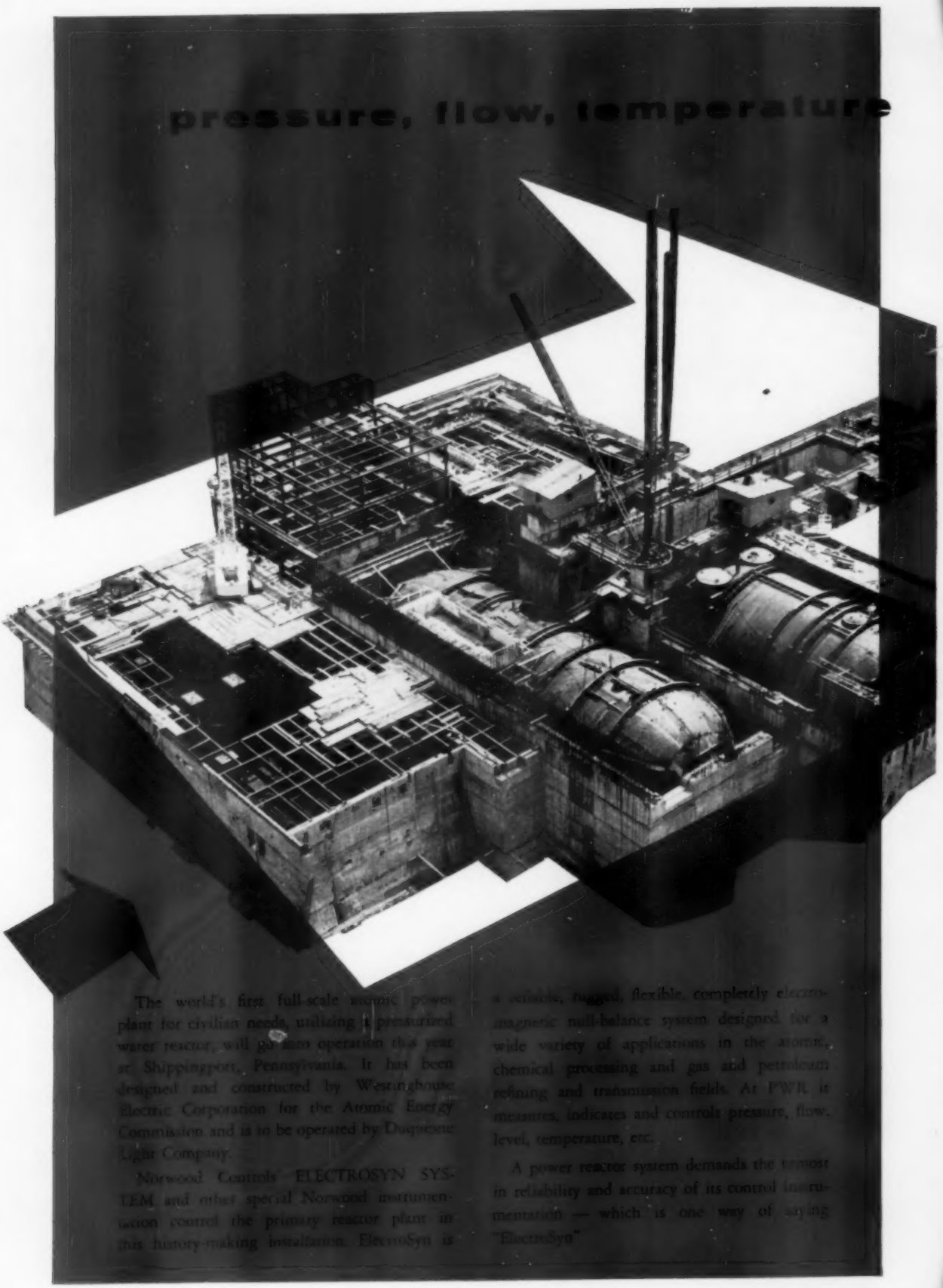
"The difference is reliability" • Since 1888

5762

WESTERN GEAR Corporation

ENGINEERS AND MANUFACTURERS

PLANTS AT LYNWOOD, PASADENA, BELMONT, SAN FRANCISCO (CALIF.)
SEATTLE AND HOUSTON—REPRESENTATIVES IN PRINCIPAL CITIES



The world's first full-scale atomic power plant for civilian needs, utilizing a pressurized water reactor, will go into operation this year at Shippingport, Pennsylvania. It has been designed and constructed by Westinghouse Electric Corporation for the Atomic Energy Commission and is to be operated by Duquesne Light Company.

Norwood Controls' ELECTROSYN SYSTEM and other special Norwood instrumentation control the primary reactor plant in this history-making installation. ElectroSyn is a reliable, rugged, flexible, completely electromagnetic null-balance system designed for a wide variety of applications in the atomic, chemical processing and gas and petroleum refining and transmission fields. At PWR it measures, indicates and controls pressure, flow, level, temperature, etc.

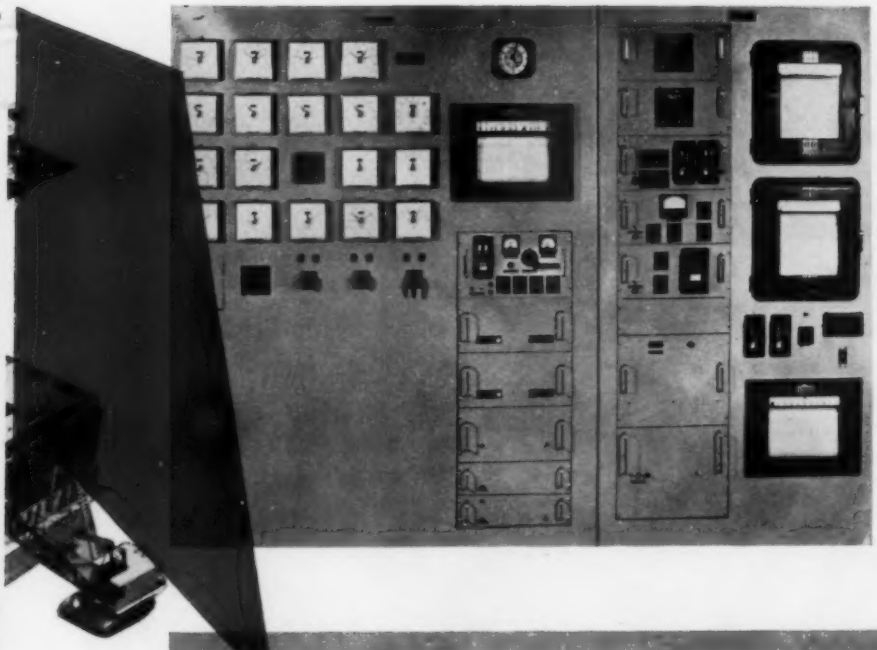
A power reactor system demands the utmost in reliability and accuracy of its control instrumentation — which is one way of saying "ElectroSyn"

in leading pipeline compressor stations,

in PWR, first U. S. full-scale atomic power station

. . . controlled by

ELECTROSYN SYSTEM



Norwood Controls' Power and Temperature Control Panel and Auxiliary Instrument Panel (at left) are the heart of the PWR reactor plant instrumentation and control system. Measurement, computation, auctioneering, alarm, and control functions are performed.

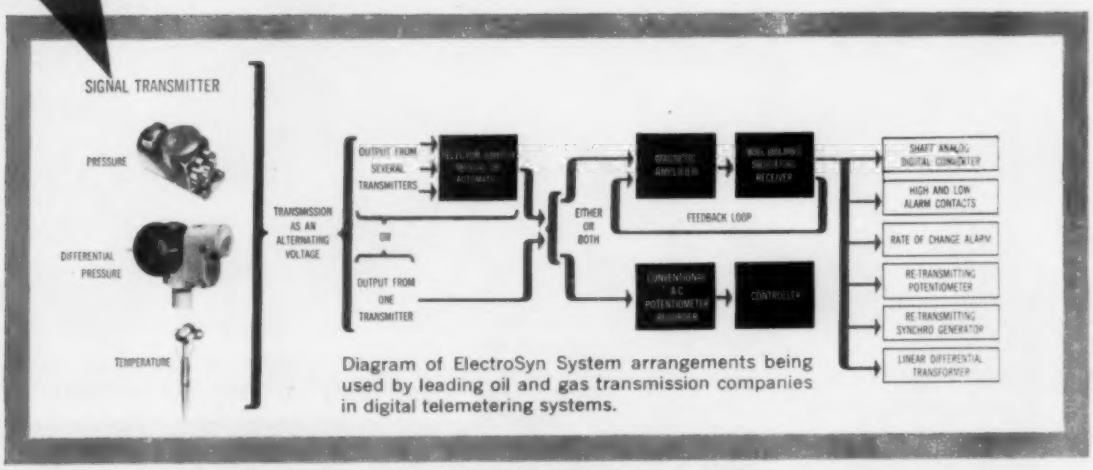


Diagram of ElectroSyn System arrangements being used by leading oil and gas transmission companies in digital telemetering systems.

Write for descriptive literature on "ELECTROSYN SYSTEMS"

NORWOOD CONTROLS

NORWOOD CONTROLS UNIT

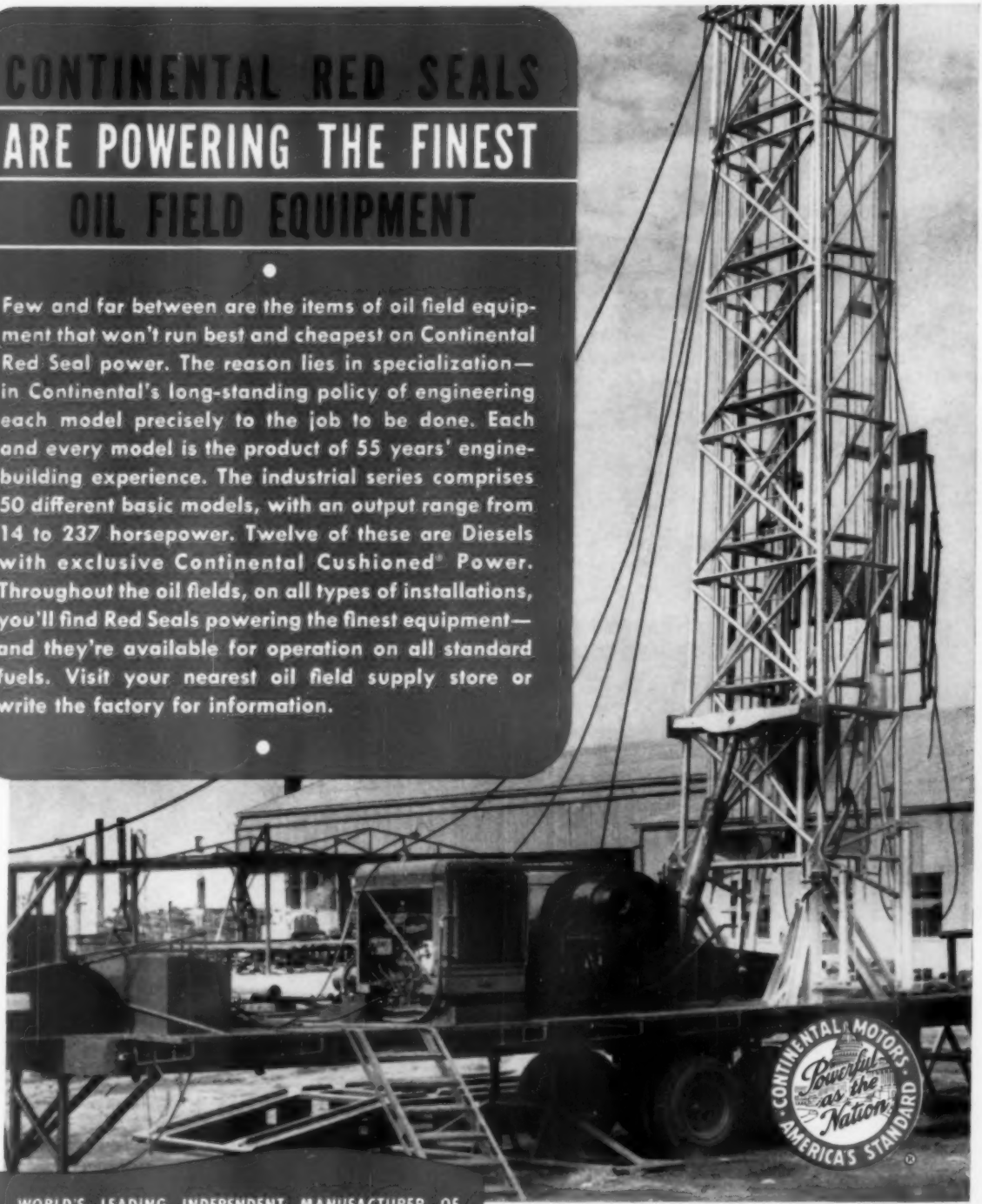
DETROIT CONTROLS

Division of AMERICAN-Standard

942 Washington Street, Norwood, Mass.

CONTINENTAL RED SEALS ARE POWERING THE FINEST OIL FIELD EQUIPMENT

Few and far between are the items of oil field equipment that won't run best and cheapest on Continental Red Seal power. The reason lies in specialization—in Continental's long-standing policy of engineering each model precisely to the job to be done. Each and every model is the product of 55 years' engine-building experience. The industrial series comprises 50 different basic models, with an output range from 14 to 237 horsepower. Twelve of these are Diesels with exclusive Continental Cushioned® Power. Throughout the oil fields, on all types of installations, you'll find Red Seals powering the finest equipment—and they're available for operation on all standard fuels. Visit your nearest oil field supply store or write the factory for information.



WORLD'S LEADING INDEPENDENT MANUFACTURER OF INTERNAL COMBUSTION ENGINES, CONTINENTAL MOTORS OPERATES PLANTS IN ATLANTA, DALLAS, DETROIT, MILWAUKEE, MUSKEGON, AND TOLEDO, AND IN ST. THOMAS, ONT., PRODUCING AIR-COOLED AND LIQUID-COOLED ENGINES FOR USE ON LAND, AT SEA AND IN THE AIR.

FACTORY-APPROVED SERVICE AND GENUINE RED SEAL PARTS ARE AVAILABLE ALL OVER THE WORLD

Continental Motors Corporation

MUSKEGON • MICHIGAN

This tubing goes to any depths for oil

TO meet the current trend to deeper wells and higher pressures, the Timken Company developed a high-strength oil well tubing of exceptional uniformity and ductility.

This tubing offers a yield strength up to 125,000 PSI. It's 20% stronger than required by the stiffest API specification—5A. It can take internal pressures up to 15,000 PSI. Actually, the well hasn't yet been drilled that can produce all the pressure Timken® seamless steel tubing can take.

Whatever your specific oil or gas well tubing problem, Timken seamless steel tubing provides a ready solution. For 24 years we have been making high pressure seamless tubing for special requirements, in a wide variety of sizes and analyses. Send for free engineering study, "Timken Oil And Gas Well Tubing", a study of various alloys for high strength and corrosion resistance. Write: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

See the first Timken Televent hour, in color, "Eleven against the ice—story of the Antarctica Turnpike". NBC-TV, Monday night, Sept. 23rd.

YOU CAN RECOVER OVER 80% PENTANES PLUS FROM LEAN NATURAL GAS

100 pounds of Davison Silica Gel adsorbs 1.5 to 3.0 gallons of hydrocarbons at 80% recovery efficiency

Why lose valuable hydrocarbons suitable for sale as gasoline, when you can recover them so easily with Davison Silica Gel?

This desiccant has high capacity for moisture and hydrocarbons, so minimum size equipment does the job. You'll find, too, that Davison Silica Gel is readily reactivated . . . gives low dewpoints . . . resists fouling . . . gives low pressure drop . . . is hard, tough, non-dusting and non-corrosive.

Why not get the whole story? See for yourself why Davison Silica Gel is ideal for natural gas dehydration and hydrocarbon recovery. Write today for literature.

Progress Through Chemistry

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

Baltimore 3, Maryland

Griscom-Russell is now entering the last decade of a

Century of Progress

Looking Backward

Ninety years ago in New York Harbor a modest ship chandlery was established to service the needs of seagoing vessels as they plied into port for fitting and repairs. The enterprise developed fast until it was manufacturing small equipment and later a line of coil tube heat exchangers, which due to their long, efficient and trouble free service, created the reputation for dependable products which The Griscom-Russell Company still enjoys. There followed equally reliable lines of Marine Distilling Plants, Tubular Exchangers, Bentube Evaporators, Feedwater Heaters and Extended Surface Heat Exchangers for land and sea service. Through the years the chemical, petroleum, utility and marine industries have recognized the increasing need for heat exchange equipment and G-R has met these needs with progressive designs and manufacturing facilities. The requirements for increasingly higher temperatures and pressures have been met by G-R's 200 engineers, designers, draftsmen and by a well qualified manufacturing personnel. Today we serve a long line of established customers in all major industries.

Looking Forward

We are now on the threshold of the atomic age, a challenge to the engineering, designing and manufacturing ingenuity of our people. Nuclear power will necessarily supplant present day power supply systems as our resources of oil and coal are depleted. G-R has been engaged in research resulting in the production of heat transfer equipment for this field. Such equipment must operate under service conditions involving fluids at temperatures and pressures in the high ranges. Severe service conditions are also met with in the petro-chemical field, an industry which is still in its infancy. In the manufacture of heat transfer equipment of this kind the most exacting manufacturing techniques must be employed. G-R has the necessary facilities including X-ray and stress relieving, ultrasonic and dye penetrant testing, welding equipment and techniques requiring specially qualified and registered operators. The indications are that the heat transfer equipment of the future will demand that these manufacturing practices become routine procedures. As in the past, G-R is prepared. To those who have new problems involving heat transfer between any fluid mediums including liquid metals, G-R engineers are able to advise. It is probable that they have already met similar situations.

GRISCOM GR RUSSELL

THE GRISCOM-RUSSELL CO.

MASSILLON, OHIO

A SUBSIDIARY OF GENERAL PRECISION EQUIPMENT CORPORATION

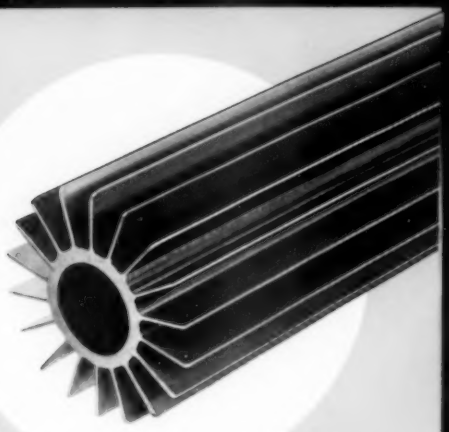
GPE

GR366

There is one type of

HEAT TRANSFER SURFACE

best suited to your next heat exchanger.



G-R can impartially and authoritatively tell you which

In some cases, *bare tubes* may be the most practical type of heat transfer surface for your needs. In other cases, *finned tubes* may provide a more efficient and compact exchanger.

G-R builds heat transfer apparatus with *either* bare tubes or finned tubes. G-R finned tube surfaces include both longitudinal G-Fin and helical K-Fin . . . two widely popular types that have proved their superiority in hundreds of thousands of installations throughout the world.

G-R builds both shell-and-tube units and open sections . . . for large or small capacities . . . for high or low temperatures and pressures . . . for clean or clogging fluids, with high or low heat transfer rates. Your problem involves some of these conditions. G-R engineers have met all these conditions in all of their combinations. Let us advise you. Call in a G-R representative today.

GRISCOM RUSSELL

THE GRISCOM-RUSSELL CO.

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MASSILLON, OHIO

HERE'S AN EXAMPLE OF G-R LEADERSHIP IN HEAT TRANSFER APPARATUS

GR361

DMS® and DME®

Latest surfactant mud materials

give fast, trouble-free drilling

DMS & DME drilling mud additives are one of the mud industry's biggest advances in decades: a "surfactant mud" system with unique in-the-hole advantages:

1. **INHIBITS SWELLING AND DISPERSION OF CLAYS.** Shale cuttings do not disperse in the mud. Formation permeability is not reduced because formation clays do not swell.

2. **MOVES CUTTINGS OUT FASTER.** Lubricates cuttings and gets them away from the bit faster and out of the hole quicker.

3. **QUICKER SETTLING IN MUD PITS.** Drilled solids settle out faster, giving less solids build-up, easy mud control, less cost for weight materials.

4. **STABLE TO HIGH TEMPERATURES.** DMS & DME muds are stable at the highest temperatures yet encountered in drilling.

These new surfactant muds are easy to use, easy to control. They let you drill faster with less strain, and pull a clean bit from a clean hole. DMS & DME are distributed to the oil industry everywhere through Baroid Division, National Lead Company. Write direct to Baroid using convenient coupon below, for a complete 10-page technical bulletin on DMS & DME.

COMPOUND MUD WITH DMS & DME TO MEET YOUR SPECIAL NEEDS

Water-phase muds can be made easily with DMS additive and standard materials. For oil emulsion muds, add DME. Both are nonionic chemicals. Other principal mud additives generally used include a polyanionic filtration control agent and electrolyte such as calcium sulfate (for a calcium surfactant mud) or sodium chloride (for a sodium surfactant mud). Complete applications are described in DMS-DME bulletin from Baroid Division, National Lead Co.

ANTARA gaf

Baroid Division, National Lead Co.
P. O. Box 1675, Houston 1, Texas

Gentlemen: Send me your DMS & DME bulletin.

Name_____ Title_____

Company_____

Address_____

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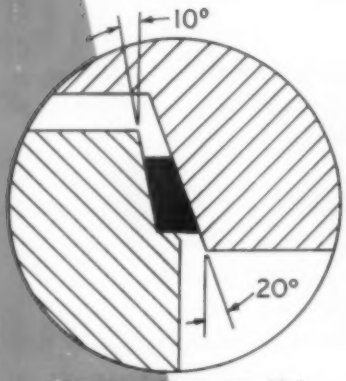
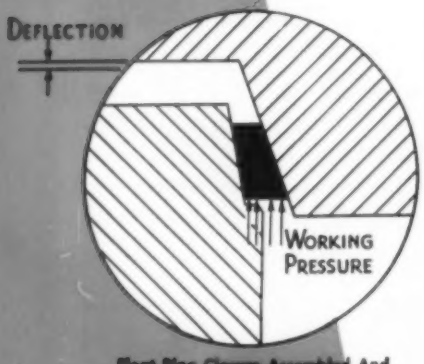
Only BS&B Oilfield Equipment Offers You This Pressure-Energized All Metal Float Ring Closure...

Typical 4" 600 lb. ASA Ring Joint Closure



Float Ring Closure Assembled With Initial Stud Load But No Internal Pressure

Typical BS&B 4" 1500 psig. Working Pressure Float Ring Closure



Float Ring Closure Assembled And Subjected To Internal Pressure

For All Medium And High Pressure Vessel Openings And Connections!

One of the *unique* features offered on many items of BS&B oilfield production equipment is the BS&B Float Ring Closure—a patented all metal, pressure-energized seal which utilizes the enclosed pressure against the sealing element to create the sealing force.

The sealing element is a tapered metal float ring which, when energized by pressure, moves up into the joint between a bell seat having a 10° taper and a spigot seat having a 20° taper. (See drawings at left). The sealing force increases in *direct ratio* to the increase in the enclosed pressure.

BS&B uses these Float Ring Closures for medium and high pressure applications on pressure vessel handholes, manways, inlet and outlet flanges, vessel end closures, liquid level controller openings and heat exchanger end connections.

Because this type closure is lighter in weight and more economical to use than ASA flanges of comparable ratings, it is now practical to provide manways or removable ends on many vessels where it formerly was prohibitive in cost to do so.

Whenever You Buy BS&B Oilfield Production Equipment, You Can Count On Getting Many Exclusive Features That Are The Result Of Latest Research And Engineering Advancements In The Industry. Ask Your BS&B Man—Or Write To...

BLACK, SIVALLS & BRYSON, INC.

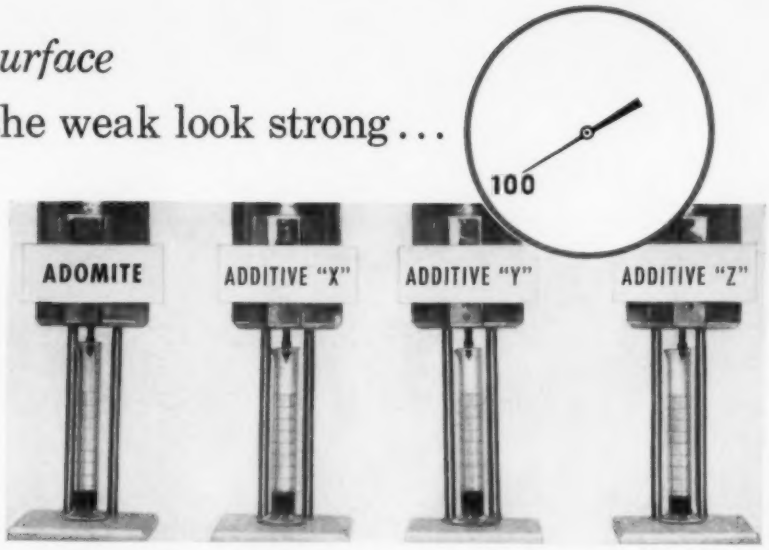
Oilfield Equipment Division, Dept. 1-A9A

P. O. Box 1714 Oklahoma City, Oklahoma

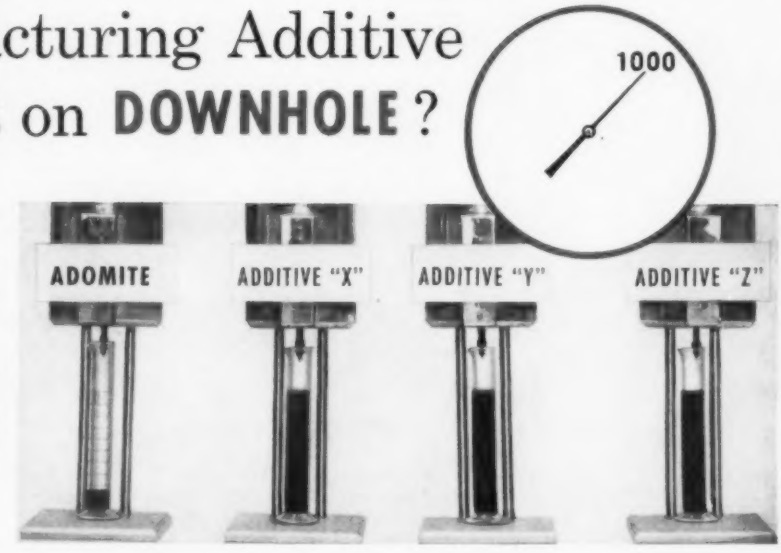
OVER 60 YEARS BS&B RELIABILITY

On the surface

even the weak look strong . . .



but which Fracturing Additive can you count on **DOWNHOLE**?



Some fluid loss control additives act impressively at surface conditions of low pressure and room temperature. But downhole, they let you down . . . with fluid loss becoming so high that their effectiveness is lost. That's what distinguishes Adomite from other fluid loss control additives. You can count on Adomite for *deep-down* effectiveness.

What's the secret of Adomite's *deep-down* effectiveness? Adomite, when mixed with oil, disintegrates into millions of tiny particles. These particles seal the face of the formation and keep the fracturing fluid from filtering in. Temporarily sealing the formation, Adomite particles do not plug it.

Where do other additives fail? These likewise contain sealing particles, but tend to soften or dissolve as temperatures increase. Consequently, fluid loss control is greatly reduced.

To be sure of least fluid loss, tell your service company to fracture with Adomite.

	Fluid Loss at Surface Conditions— 100 psi,* 75°F., cc/30 min.	Fluid Loss at Bottom Hole Conditions— 1000 psi, 150°F., cc/30 min.
Adomite plus crude oil	2.2	22.0
Additive X plus crude oil	37.8	Infinite
Additive Y plus crude oil	8.5	Infinite
Additive Z plus crude oil	13.0	295 (1 min., 50 sec.)

* Standard API Code 29 Test

fracture with

Adomite®

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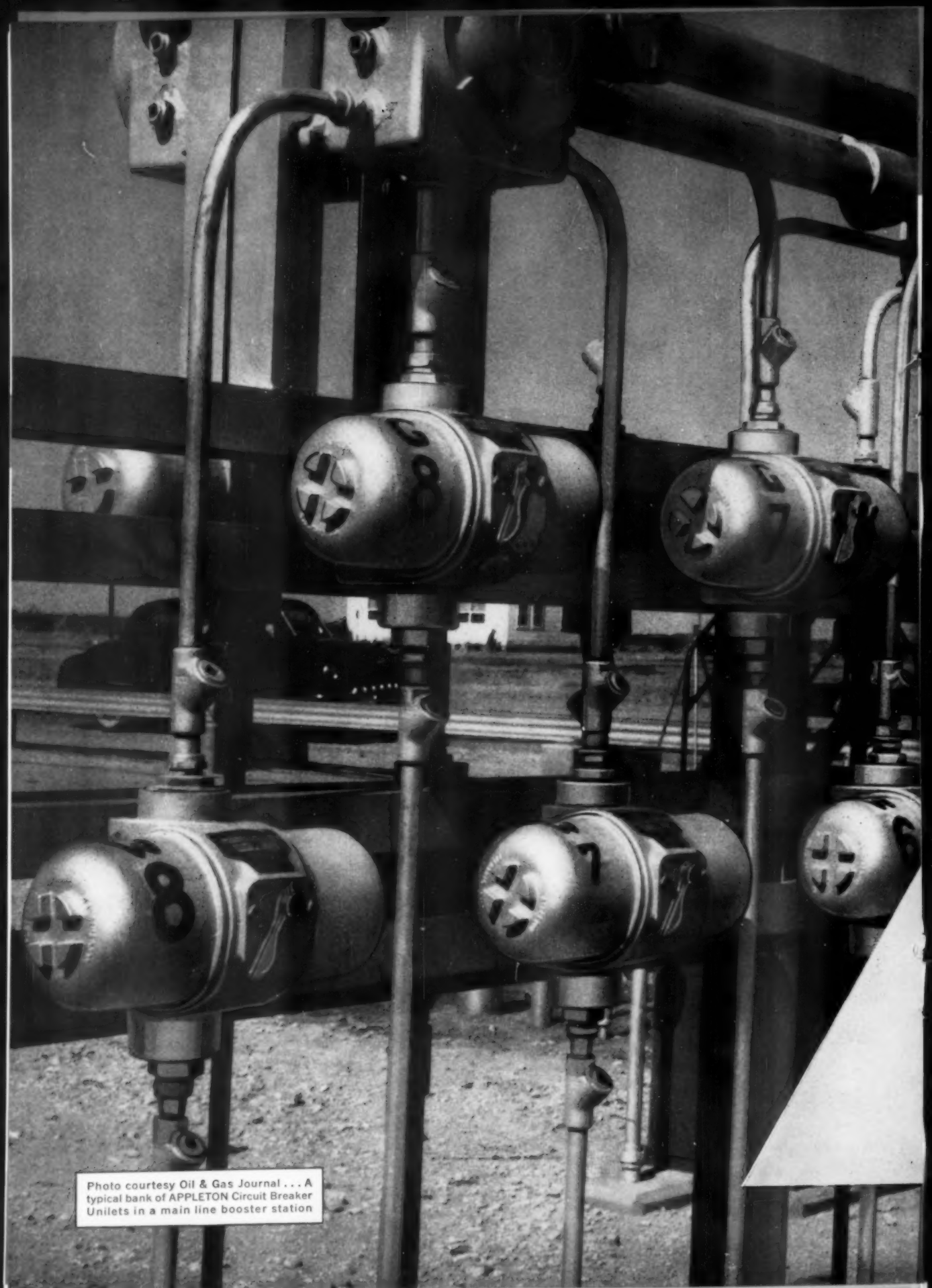


Photo courtesy Oil & Gas Journal . . . A typical bank of APPLETON Circuit Breaker Unilets in a main line booster station

The Choice of America's Leading Electrical Engineers

APPLETON

CIRCUIT BREAKER, MOTOR STARTER and COMBINATION MOTOR STARTER

UNILETS®

APPLETON Circuit Breaker and Motor Starter Unilets . . . your best choice for positive lasting protection against explosion, dust, and rain! Regardless of the installation, where absolute safety is required . . . APPLETON can serve you better!

7 REASONS FOR APPLETON SUPERIORITY
1. Full 7-thread explosion-proof protection. 2. Unmatched accessibility. 3. Compact, lightweight construction. 4. Unit may be added quickly, easily. 5. Flexible field set-ups with single and duplex male and female hub adapters. 6. Combinations meet U.L. requirements through approval of components. 7. First to be U.L. approved for banked circuit breaker grouping.

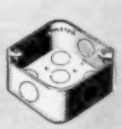
SOLD THROUGH FRANCHISED WHOLESALERS ONLY

Also Manufacturers Of:

Explosion-Proof Fixtures

Reeflites

Industrial Lights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Rely on APPLETON ... The Standard for Better Wiring®

PROBE

for atomic hydrogen under operating conditions

CORROSION CONTROL programs that require data on hydrogen diffusion in pipe-line or vessel walls will find the COSASCO Hydrogen Probe a valuable tool. Since it is installed through a COSASCO *Access* Nipple, it can easily be inserted or withdrawn at any time while vessel or line is on stream. It can be used to detect presence of free atomic hydrogen and to gauge rate of hydrogen diffusion by calibrating pressure rise within the hydrogen accumulation annulus.

The Hydrogen Probe is but one of the specialized COSASCO *Access* Plugs available for obtaining corrosion rate, cause and correction data. With them, corrosion coupons, water samplers, and thermocouples may be placed in transmission, storage, recovery or processing equipment without requiring shutdown because of pressures encountered.

COSASCO ***Access Nipples,*** through which entry is obtained, also permit important reductions in valve and other external equipment investments for wellheads, pipe lines and vessels. In addition, they increase safety ...now proved in industry-wide installations.

Is Operating Pressure Keeping You Out?

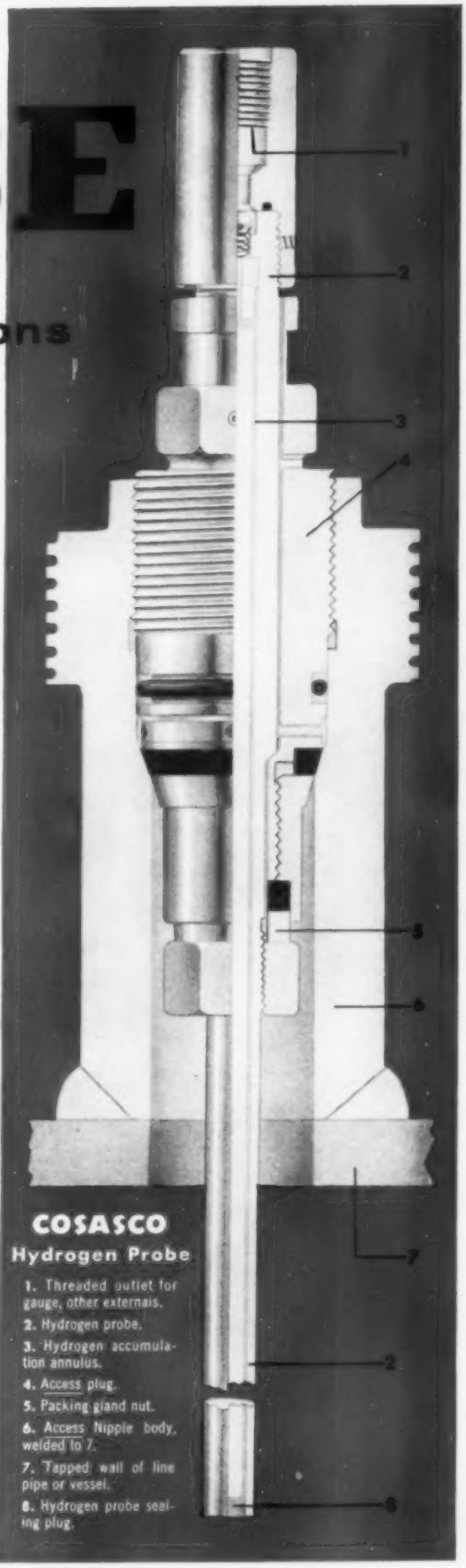
If you have an entry-against-pressure problem, COSASCO engineers can help you overcome it. Send details and blueprints depicting your problem and the COSASCO solution will be supplied promptly and without any cost to you whatsoever. *Write directly to COSASCO* Division of Perfect Circle Corporation, at the address below.

Protect equipment...Save product

COSASCO

DIVISION OF PERFECT CIRCLE CORPORATION

11655 McBean Drive, El Monte, California
Export Office: 3631 Atlantic Avenue, Long Beach 7, California



COSASCO
Hydrogen Probe

1. Threaded outlet for gauge, other externals.
2. Hydrogen probe.
3. Hydrogen accumulation annulus.
4. Access plug.
5. Packing gland nut.
6. Access Nipple body, welded to 7.
7. Tapped wall of line pipe or vessel.
8. Hydrogen probe sealing plug.

65 belt hp!
up to 15,500 lb drawbar pull!
forward speeds from 1.5 to 5.5 mph!
reverse to 4.1 mph!

ALLIS-CHALMERS

HD-6

Tractor-Dozer

MORE POWER—BETTER DOZING SPEEDS—BIG-DOZER DESIGN—NEW HANDLING EASE!

Only dozer of its size with these basic advantages . . . engine-mounted rams, long push beams, fewer linkage points (only 2 instead of 5 or 6). These big-dozer features all combine to provide more accurate, gouge-free dozing . . . longer equipment life.

Convenient rotary-valve blade control makes the HD-6 the easiest handling dozer of its size. With more than 5½ feet of track on the ground, it has outstanding flotation . . . yet turns easily in any terrain. The HD-6 also combines large, low-set front idlers with a blade snugged close to the radiator guard . . . to provide balance that means better dozing, more work done under any conditions!

You can <u>see</u> it . . . but there's only one way to <u>prove</u> it—on **your** job!

RUST-OLEUM
STOPS RUST!
Rust-Oleum is distinctive as your own fingerprint. Accept no substitute.
. . . goes on faster, stops rust, lasts longer over rust!
RUST-OLEUM
STOPS RUST!

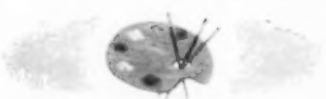
ONE MAN often does the work of two!

EASIER TO USE—because Rust-Oleum 769 Damp-Proof Red Primer goes over rusted metal after scraping and wirebrushing to remove rust scale and loose rust—usually eliminating costly surface preparations. *Stops Rust*—because Rust-Oleum's specially-processed fish oil vehicle *penetrates* rust to bare metal—driving out air and moisture that cause rust.

LASTS LONGER applied over rust—and teamed up with Rust-Oleum's many attractive finish coatings, assures lasting beauty. Try Rust-Oleum on *your* tanks, metal sash, machinery, wire fences, stacks, girders—or around *your* home. Prompt delivery from Industrial Distributor stocks. Write for illustrated literature with color charts showing colors and applications.

RUST-OLEUM CORPORATION • 2480 Oakton Street • Evanston, Illinois

RUST-OLEUM®



30% GREATER COVERAGE—MANY ATTRACTIVE COLORS

Rust-Oleum covers up to 30% more area, depending upon surface condition and porosity. And you can beautify as you protect with Rust-Oleum finish coatings in Aluminum, White, Red, Gray, Green, Blue, Yellow, Black, etc.

STOPS RUST!®

Rust-Oleum and Stops Rust are brand names and registered trademarks of the Rust-Oleum Corporation.

Write for special report showing Rust-Oleum penetration to bare metal.

You can see it, but there's only one way to prove what the HD-6 can do for you!

Call your nearby
Allis-Chalmers construction machinery dealer
—he'll demonstrate one on your job NOW!

. . . or send us this

Allis-Chalmers
Construction Machinery Division
Milwaukee 1, Wisconsin

Gentlemen:

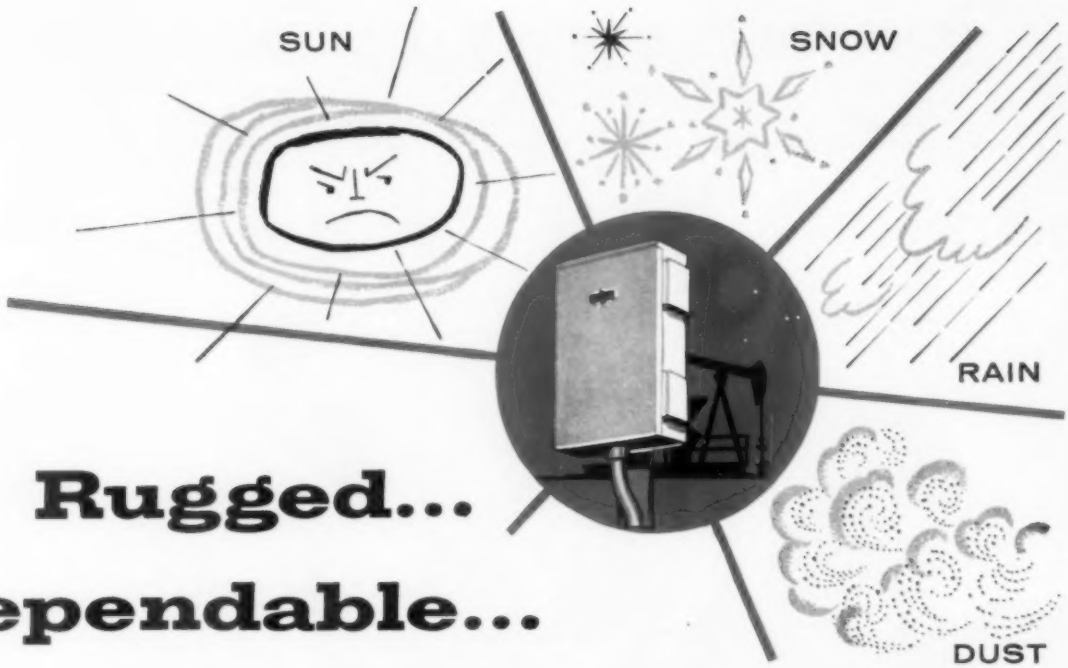
Please have the Allis-Chalmers construction machinery dealer serving my area arrange a demonstration of the HD-6 tractor-dozer for me.

Name_____

Address_____

City_____ State_____

Type of Work_____

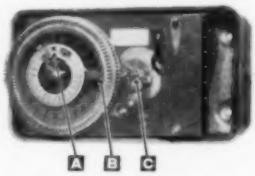


Rugged... Dependable... Completely Automatic...

CUTLER-HAMMER THREE-STAR OIL WELL PUMPING CONTROL is the overwhelming choice of oil field engineers everywhere. No other control is as rugged . . . Cutler-Hammer control is immune to blistering heat, to choking dust, to driving rain, sleet and snow. No other control is as dependable . . . Cutler-Hammer control, featuring vertical dust-safe contacts, can be relied upon to pump your wells *indefinitely* without attention as far as the electrical equipment is concerned. No other control is as completely automatic . . . the Cutler-Hammer Supertimer has made oil well pumping by *automation* a reality.

For your next pumping well, insist on Cutler-Hammer Three-Star Oil Well Pumping Control. No other control offers as many outstanding features: exclusive Cutler-Hammer Supertimer—Three-Star magnetic contactor with vertical dust-safe contacts—aluminized, chimney draft-design enclosure—vertical contact contactor type disconnect switch—advanced-design lightning arresters—full three-phase, three coil overload relay—selector switch for automatic or manual operation—dead phase protection—double door isolation of live parts—undervoltage release relay—spring-clip type fuse receiver—removable steel component base plate—padlock features for outer door, inner door, and Supertimer.

Your nearby Authorized Cutler-Hammer Distributor is stocked and ready to serve your needs. Order from him today. CUTLER-HAMMER, Inc., 1453 St. Paul Ave., Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.



NEW CUTLER-HAMMER

Supertimer

This is automation in action. You pre-set the Supertimer to meet your field allowable and the control will do the rest, automatically. It starts, stops, restarts and cycles indefinitely, precisely according to your schedule. If a power outage occurs, any number of C-H controlled pumps are automatically restarted in an exact sequence to avoid overloading the power lines on inrush. Unfortunate coincidental starting of even two pumps is impossible.

- **A** Sets the precise restarting time delay from zero to 180 seconds. This is exclusive with the Supertimer—unfortunate coincidental starts of even two pumps are impossible.
- **B** Sets the daily pumping schedule—pull a tab for each fifteen minutes of pumping, space them through the daily 24 hour period as desired.
- **C** Sets the weekly pumping schedule—1, 2, 3, 4, 5, 6 or 7 days per week as desired.

CUTLER-HAMMER
MOTOR CONTROL
C-H

Member American Petroleum Institute

COMPLETE PROTECTION. The control is protected against lightning with exclusive, advanced-designed lightning arresters; and the three coil overload relay protects the pump motor from overloading and dangerous single phasing which often results from lightning.

CHIMNEY DRAFT VENTILATION. The heat-reflecting, aluminized enclosure insures a constant circulation of air . . . no nuisance tripping because of trapped heat.

DUST-SAFE CONTACTS. Dust-Safe vertical contacts stay clean and eliminate the necessity of contact replacement.

FOXBORO BREAKS "RANGE BARRIER" IN SMALL-FLOW TRANSMISSION

Flows as small as .003 gpm accurately measured, with new Integral Orifice d/p Cell* Transmitter

Now you can measure and transmit small flows with full accuracy and dependability! The new Integral Orifice d/p Cell Transmitter easily handles exceedingly low flow rates formerly impossible in pilot plant operations, research problems, and fluid ratioing.

Installed directly in the process line, the Foxboro Integral Orifice d/p Cell Transmitter needs no meter primary device or connection-piping . . . and no straight runs. It can be installed in any position. A direct 3-15 psi output signal is delivered to any standard indicator or recorder.

By suitable range selection through change of orifice inserts, flow rates as low as 0.003 gpm or as high as 5.0 gpm can be accurately measured.

The Foxboro Type 13A Integral Orifice Transmitter gives you, not only new high accuracy in measurement, but also accurate remote indicating and recording. Write for complete details. **The Foxboro Company, 609 Norfolk St., Foxboro, Mass., U.S.A.**

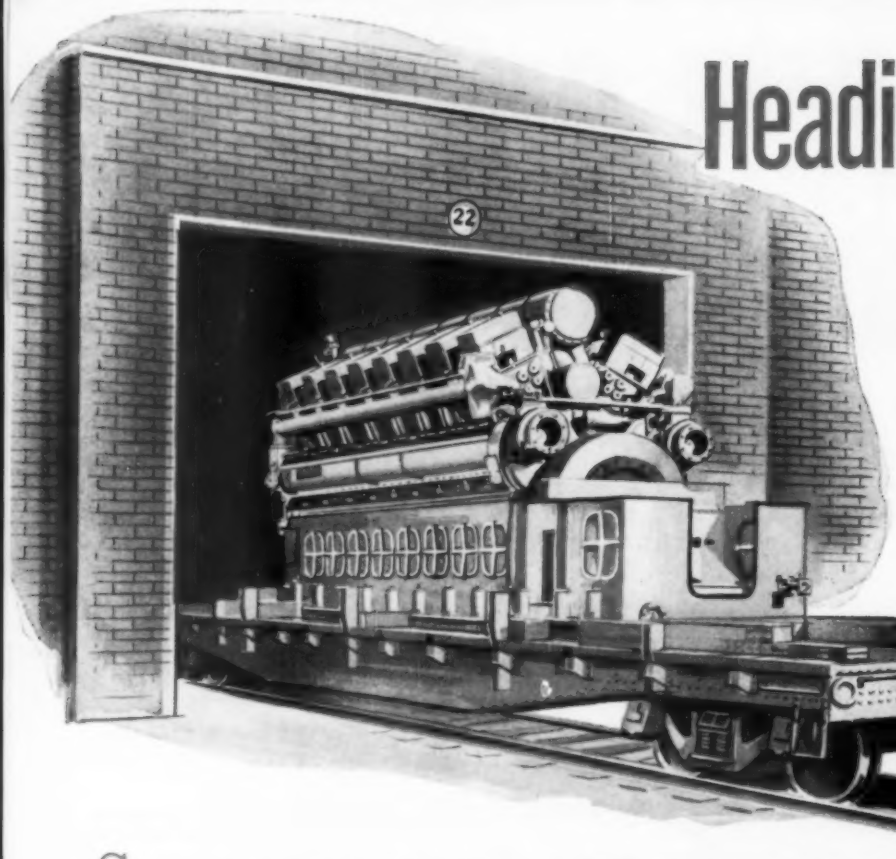
*Reg. U.S. Pat. Off.

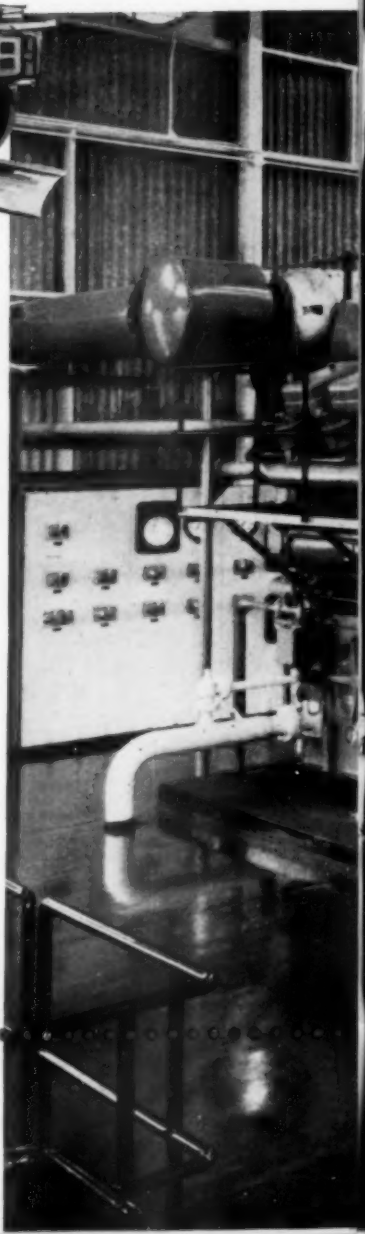
Left—Set of six interchangeable orifices is available in standard bore sizes from 0.020" to 0.250". They're easily changed in the field . . . merely inserted within the transmitter connection block. Differential pressure across orifice is converted to directly proportional 3-15 psi air output signal and transmitted to remote indicator or recorder.

FOXBORO
REG. U.S. PAT. OFF.

INTEGRAL ORIFICE
d/p cell transmitter

Heading for low more and Engine





Shipments of Nordberg Supairthermal® Gas Engines with integral gears for compressor service emphasize the increasing application of these highly efficient prime movers by major gas transmission companies.

Advantages of Supairthermal gas engine-gear sets are summarized as follows:

(1) Lower cost per installed horsepower; (2) Lower operating cost; which results in (3) Lower transmission cost.

(4) Ability to handle variations in volume and compression ratios with high efficiency at variable speeds.

(5) Adapability to remote-automatic operation.

Nordberg engines are, by all standards, your best investment in economical, long term pipe line power. Chances are, you too will benefit by using Nordberg engines on your next pipeline expansion program. Write for further information.

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

0457

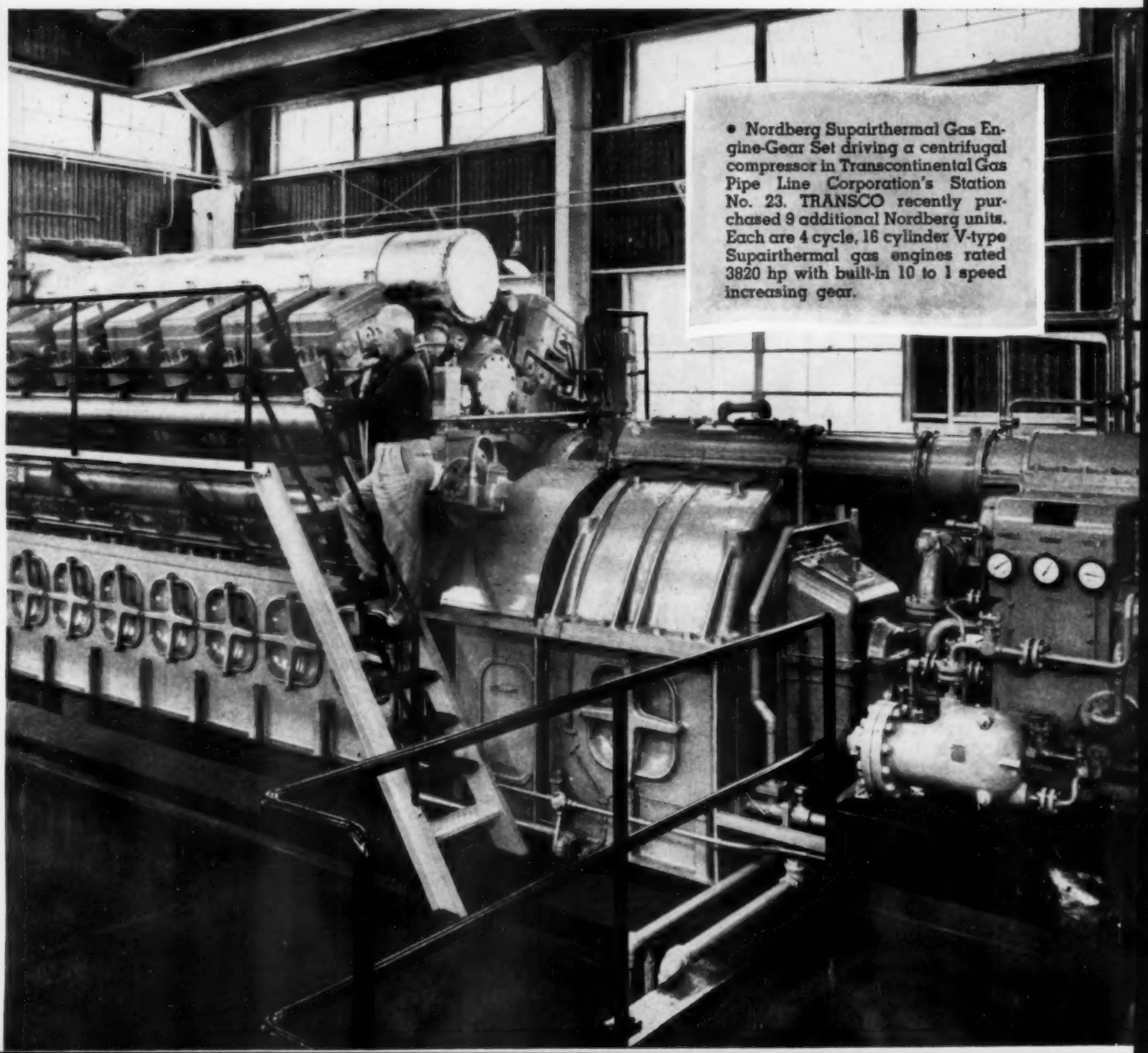
© 1957, N. M. Co.

NORDBERG MFG. CO., Milwaukee, Wisconsin

Gas Pipe Line Transmission Costs...

more NORDBERG

Centrifugal Gas Compressor Sets



• Nordberg Supairthermal Gas Engine-Gear Set driving a centrifugal compressor in Transcontinental Gas Pipe Line Corporation's Station No. 23. TRANSCO recently purchased 9 additional Nordberg units. Each are 4 cycle, 16 cylinder V-type Supairthermal gas engines rated 3820 hp with built-in 10 to 1 speed increasing gear.

YOU GET

Close-to-home Service by Pump-wise Distributors

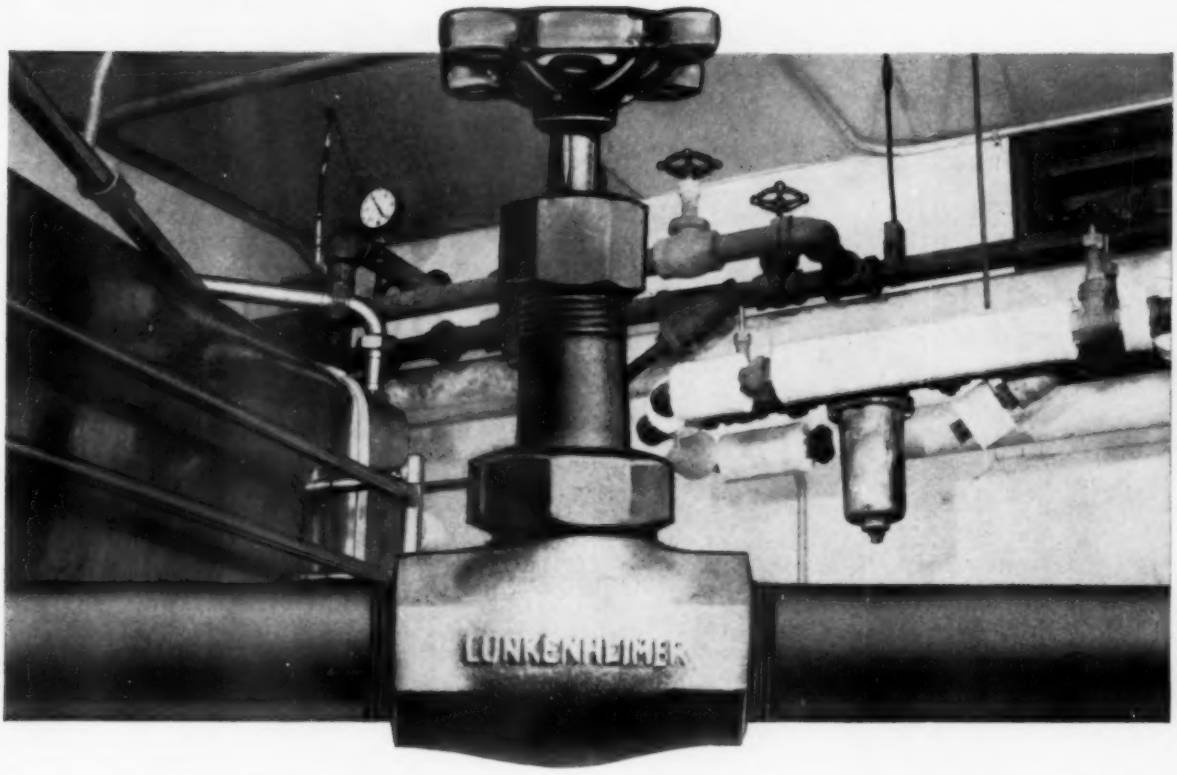
WHEN YOU SAY GASO

- Gaso distributors know pumping conditions and how to meet them.
- They carry stocks of pumps and parts.
- They are Gaso-trained and service-minded.
- They bring GASO experience, facilities and products to your doorstep.
- *We are as close to you as our nearest distributor.*

GASO PUMPS
for every oil industry need

GASO PUMP & BURNER MFG. CO.
TULSA, OKLAHOMA
Export Office: 149 BROADWAY, NEW YORK

ONE ANSWER
to spiraling maintenance costs



LQ600—The Most Maintenance-Free Bronze Globe Valve Ever Developed!

The moment a maintenance man touches a wrench to a valve, its cost can double. You can't bring down that labor expense in many plants, but you can buy valves with an outstanding record of trouble-free service. At no time in history has valve quality been so important to your total plant expense. And quality has been a tradition for nearly a hundred years at The Lunkenheimer Company, Box 360, Annex Station, Cincinnati 14, Ohio.

See your cost-reducing Lunkenheimer distributor . . . or write for literature.

BRONZE • IRON • STEEL • PVC

The cost of a LUNKENHEIMER VALVE
Gets smaller...and smaller...and smaller...
with each passing year of dependable service

4-757-9

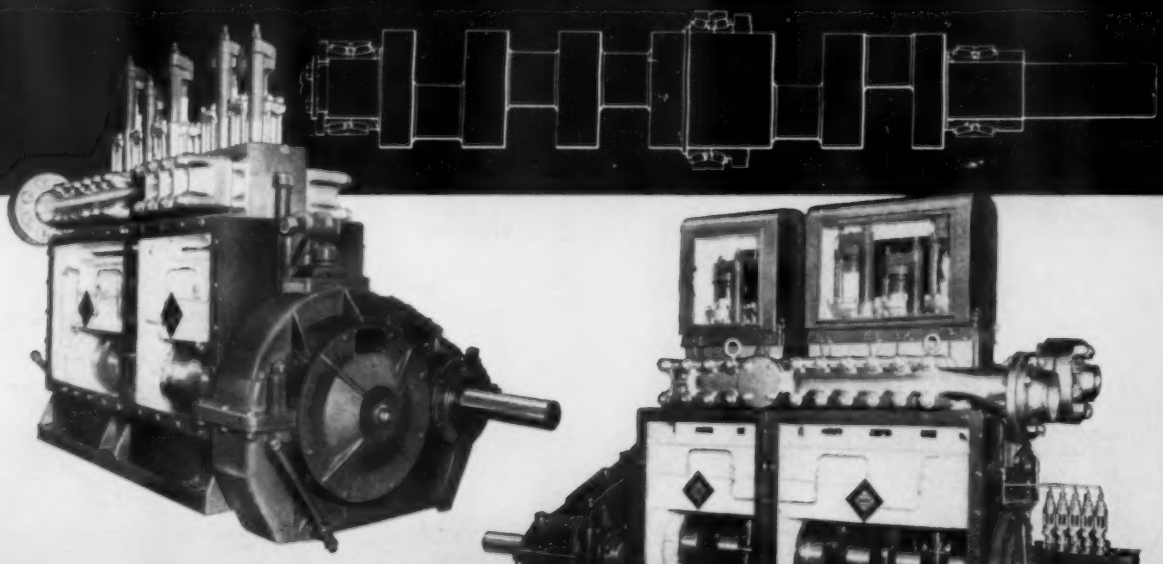
LUNKENHEIMER L QUALITY®

LUNKENHEIMER®
THE ONE *Great* NAME IN VALVES

NOW AJAX builds a

First in the Field with 3

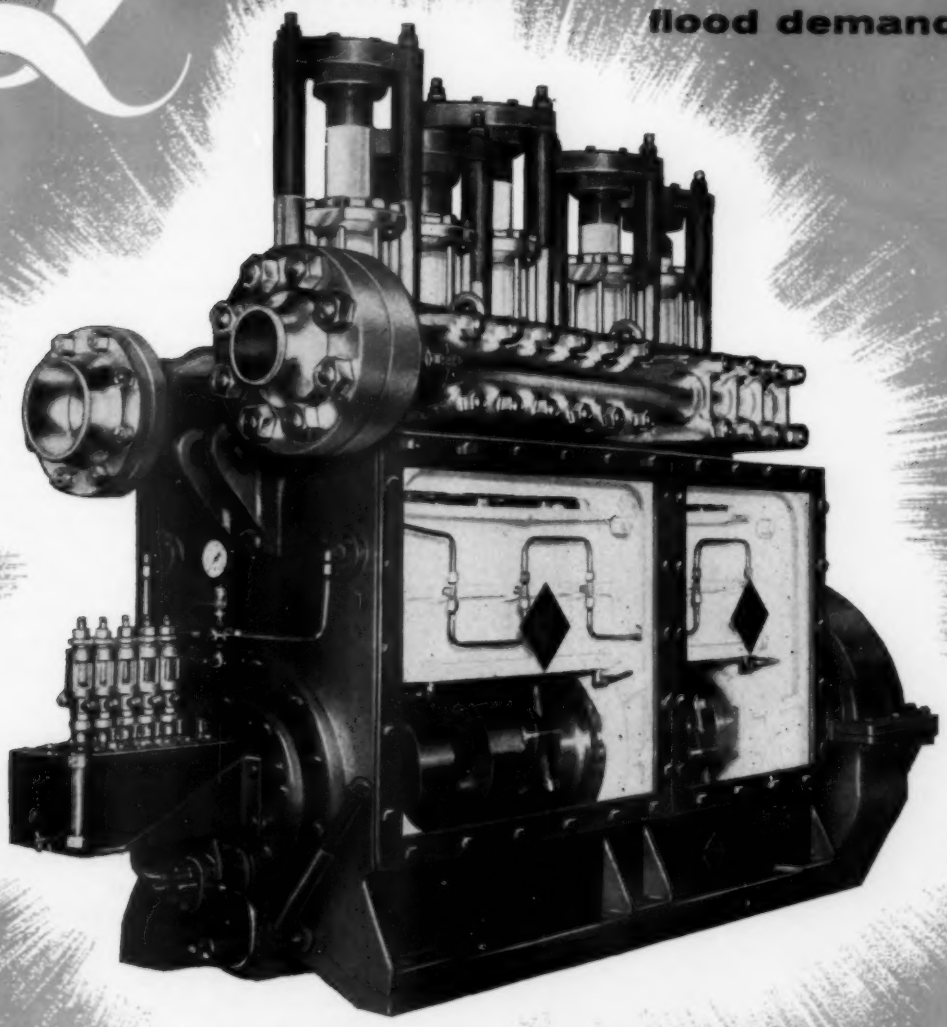
For the first time in any pump, AJAX provides *three* tapered, double-row roller bearings in the QUINTUPLEX crankshaft. This forward step by Ajax, the *pioneer* in applying roller bearings to reciprocating machinery, means unparalleled long life, low bearing loading in minimum space, absence of adjustment, *modern efficiency* in design that typifies the entire QUINTUPLEX unit. Check this feature against any other pump on the market!



Built-on, factory-installed speed reducer is available for the Ajax QUINTUPLEX as specified.

Quintuplex PUMP

for high-volume water flood demands



Today there's a big new brother for the famous Ajax Triplex pump! Providing greater volume for bigger projects, the Ajax QUINTUPLEX Pump features a forged alloy steel heat treated crankshaft, equipped with three double row tapered roller bearings permanently adjusted at the factory. Sectionalized fluid end, one-piece rigid frame and many other service-proved advantages of our Triplex are present in the QUINTUPLEX —including Ajax-pioneered reversible nylon valves, unique AJAX developed pressurized lubrication, full-vision windows, etc. Maximum interchangeability of parts is an additional important customer benefit.

• Your Supply Man has the AJAX QUINTUPLEX facts—ask him!

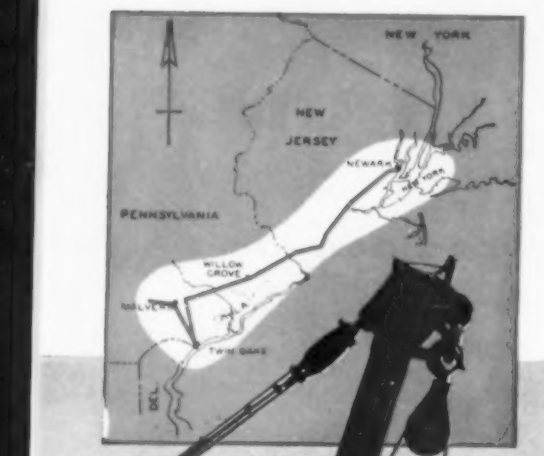
AJAX IRON WORKS

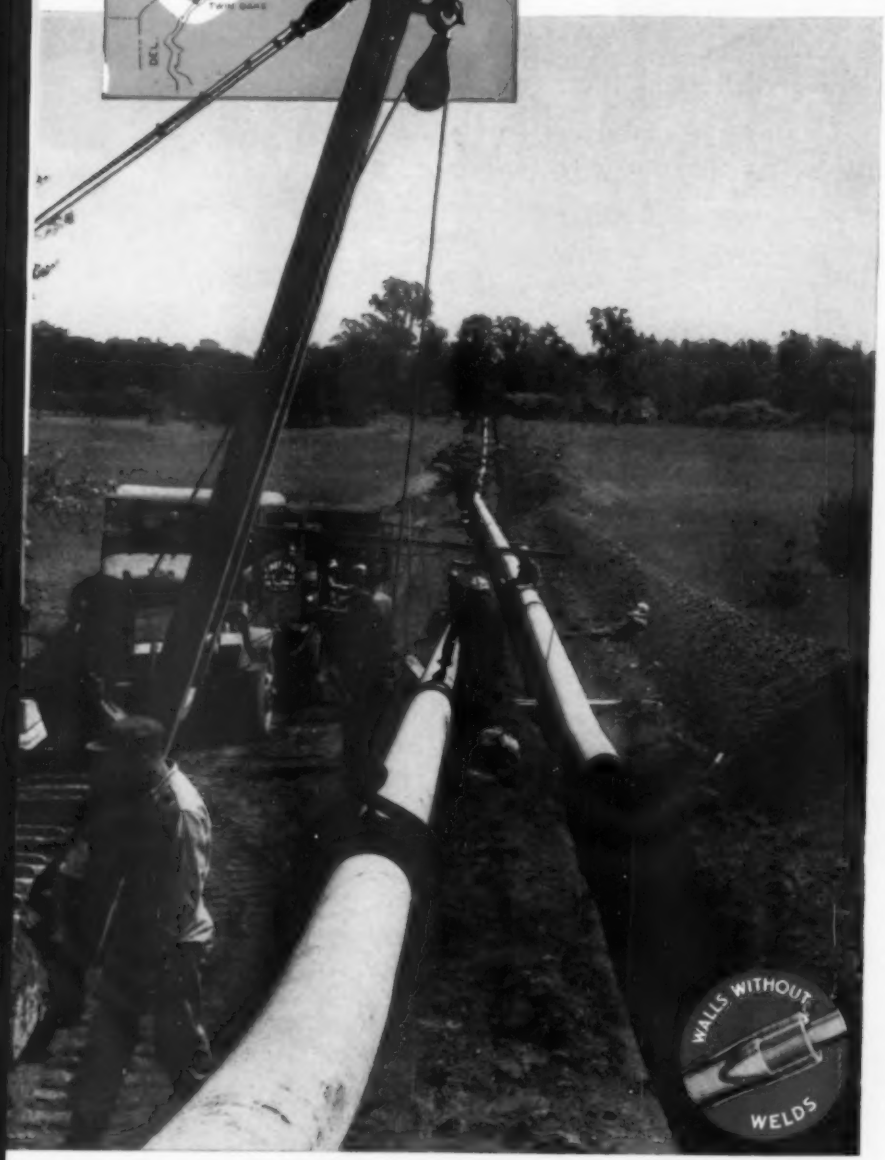
Builders of GAS AND OIL ENGINES, PRESSURE PUMPS, STEAM DRILLING ENGINES, INDUSTRIAL STEAM ENGINES

CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., PITTSBURGH, PA.
R. B. MOORE SUPPLY CO., BOLIVAR, N.Y. • BETHLEHEM SUPPLY CO., TULSA, OKLAHOMA

Sun Pipe Line Company's new 110-mile line of NATIONAL SEAMLESS doubles delivery capacity to vital Newark-New York area.





10,951 tons of 14" National Seamless Pipe — varying in wall thickness from ¼" to ½" —now enables Sun Pipe Line Company to double its delivery to its Newark plant. The new pipeline also saves time, because it largely eliminates the need for water transportation from Twin Oaks, Pa., into crowded New York Harbor.

Requiring only one pump station, at Twin Oaks, better than 83,000 barrels of gasoline or 65,000 barrels of fuel oil can be handled every day. The new 14" pipeline replaces Sun Pipe Line Company's old line . . . also constructed of National Tube pipe. It crosses three major rivers, the Schuylkill, Delaware and Raritan. These underwater portions of the line utilize the ½" wall sections, where extra stress and strain are exerted. But withstanding extra-rough conditions is "old hat" to National Seamless Pipe . . . its reputation for accomplishing difficult tasks is well established.

National Seamless Line Pipe combines the characteristics of high strength, extreme flexibility, and uniformity, with superior welding properties, to assure the user of many years of satisfactory service.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

In Pipelines Too . . . Seamless Does It Better

NATIONAL SEAMLESS PIPE AND TUBES

USS

UNITED STATES STEEL

NOW! HYDROGEN PEROXIDE FROM COLUMBIA-SOUTHERN

Bleach	Disinfectant
Oxidizer	Bactericide
Reducer	Epoxidizer
Catalyst	Propellant
Reagent	Energy Source

Hydroxylation agent

Very high purity, new-process Hydrogen Peroxide is now available from Columbia-Southern's spanking new facilities at Barberton, Ohio. Concentrations are 35% and 50% by weight in water solutions. Shipment is made in 30 gallon aluminum drums (265 lbs. of product) and 4,000, 6,000 and 8,000 gallon tankcars.

FOR INFORMATION AND SAMPLES, CONTACT OUR PITTSBURGH OFFICE OR ANY OF OUR FOURTEEN DISTRICT SALES OFFICES.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago
Cleveland • Boston • New York • St. Louis
Minneapolis • New Orleans • Dallas • Houston
Pittsburgh • Philadelphia • San Francisco
IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

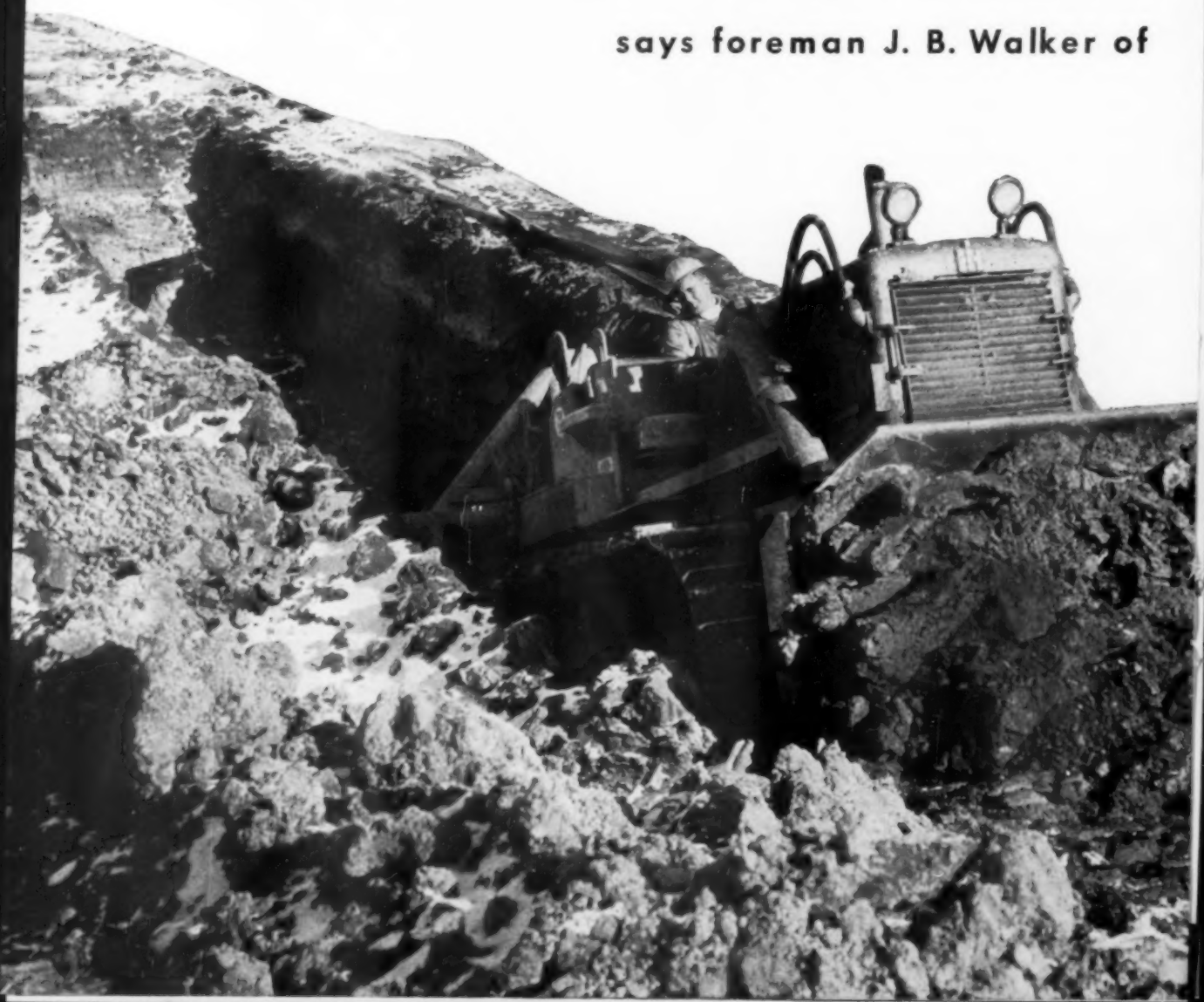
All the Calvert mud and cementing trucks plus one carrying welding equipment are towed across the plowed field to the job site by the TD-18.

The 20,000-lb draw works is maneuvered into the desired location across the cut up field by the TD-18 and Carco winch.

5 REASONS WHY INTERNATIONAL

"best oil field crawler we

says foreman J. B. Walker of



Here the 30,000-lb mud pump is spotted next to a completed pit with a big assist from the TD-18 crawler and winch.

Final operation by the crawler consists of hoisting the 96-ft mast into an upright position above the drill platform.

TD-18 IS

ever used"

Calvert Drilling, Inc.

The far-flung jobs of Calvert Drilling, Inc., Albion, Ill., have one thing in common: on-schedule completions. The power that pushes schedule completions in five fields in Illinois, Colorado, and North Dakota is supplied by five bonus-powered International TD-18 oil field crawlers.

Here is one of Calvert's TD-18's wrapping up an entire job in a field near St. Peter, Ill., in just 24 working hours. The TD-18 tows in supply trucks...punches out pits...spots the draw works and mud pump...and winches up the 96-ft. mast.

Foreman J. B. Walker reports: "This new 182 series TD-18 is the best oil field crawler we've ever used. Has both power and unmatched operating ease. It's a tractor we depend on to keep the operation on schedule. It's the company's 8th TD-18 in the last 8 years operation. All have proved their work ability under every condition possible with very low downtime."

Compare the job-speeding drawbar pull you get from a TD-18—right on your drill site. Measure International crawler Cerametallic clutch action, for operating and servicing ease—power-transfer efficiency—long life. Inspect International's new full-floating track roller seals with the 500-hr lube interval. Examine the new full-flow lube oil filters with 480-hr capacity. Prove flush-deck safety, "Control Tower" visibility, new booster steering, as production aids.

See your International Construction Equipment Distributor for a new Bonus-Powered crawler demonstration. He can fill your every oil field power need—from an International Drott TD-6 4-In-1 to a TD-24 that gives you famous Planet Power steering with full-time "live" traction-matched power on both tracks.

Calvert's International TD-18 hurriedly cuts out two 38 and 45-ft slush pits and a 35 x 35-ft reserve pit in the frozen ground. Using the inside mounted 'dozer with less overall width, permits them to move the rig from job to job without dismantling, and stay within highway limitations.

VALUE MEASURED
BEST
Used Equipment
BUY!

INTERNATIONAL®
CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

Struthers Wells

STOCK Heat Exchangers Save you money!

Code Equipment at Production Prices

Struthers Wells standard stock heat exchangers have secured a wide acceptance in the process industries.

The illustration shows a partial view of units currently in stock. Equipment is available from stock in sizes from 20 to 300 square feet of surface—including fixed tube sheet, floating head and U-tube units.

Condensers, coolers, heaters, and reboilers can be supplied in single and multi-pass tube arrangement.

Standard heat exchanger construction includes materials of carbon steel, non-ferrous alloy, and stainless alloys Type 304 and Type 316. Equipment meets highest construction standards, including ASME Code and TEMA Class A.

Standardization of design and quantity production enables us to offer this equipment at a very reasonable cost.

Price sheets and standard data are available on request; please address us on your letterhead.

STRUTHERS WELLS PRODUCTS

PROCESSING EQUIPMENT DIVISION

Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

BOILER DIVISION

BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION

Crankshafts . . . Pressure Vessels . . . Hydraulic Cylinders . . . Shafting . . . Straightening and Back-up Rolls

MACHINERY DIVISION

MACHINERY for Sheet and Structural Metal Forming . . . Tangent Benders . . . Folding Machines . . . Roller Table and Tumble Die Bending Machines . . . Press Brakes . . . Punching and Notching Machines . . . Forming Dies

ANY SIZE AVAILABLE FOR QUICK DELIVERY

STRUTHERS WELLS Corporation

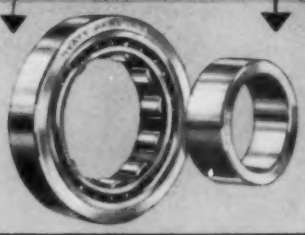
Struthers Wells

WARREN, PA.

Plants at Warren, Pa. and Titusville, Pa.

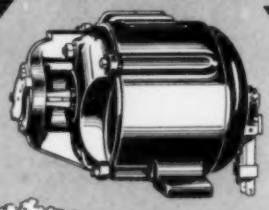
Offices in Principal Cities

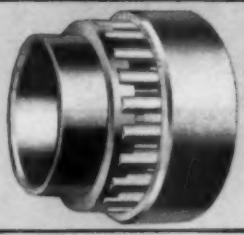
There's a HYATT HY-ROLL for every load...



HY-LOAD
Series

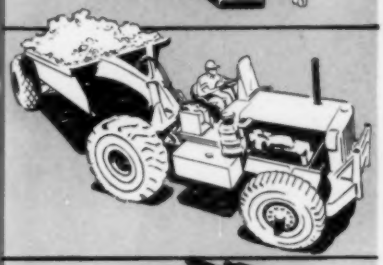
Designed for a wide variety of radial loads, and light or intermittent thrust loads, these high-capacity bearings are made in four diameter series and fourteen major types.

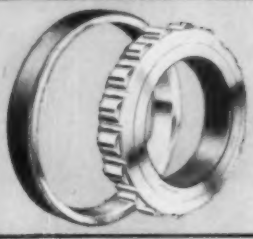




INDUSTRIAL INCH
Series

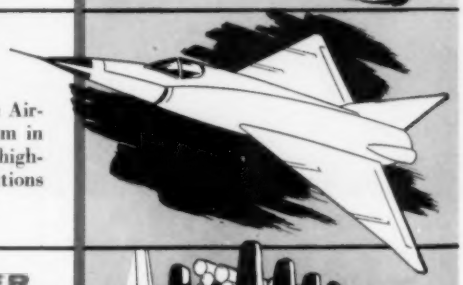
For heavily-loaded, slow-moving machinery, the Industrial Inch Series was designed to accommodate large diameter shafting where fractional dimensions are required.

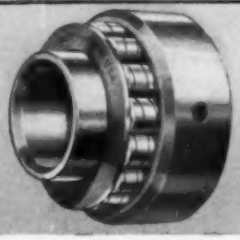




AIRCRAFT
Series

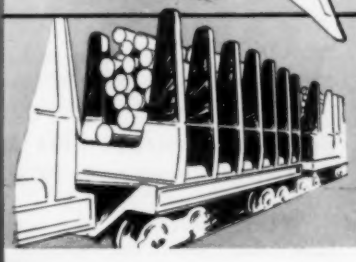
Available in over 100 sizes, the Aircraft Series attains the optimum in life-load combinations for ultra high-speed, high-temperature applications and maximum dependability.





WOUND ROLLER
Series

Specifically developed for maximum resistance to shock, abrasion and fatigue, these three-part, separable bearings can be used without the inner race when desirable.



If you would like the technical assistance of an experienced sales engineer, phone or write Hyatt Bearings Division, General Motors Corporation, Harrison, N.J.; Pittsburgh; Chicago; Detroit; Oakland, California.

FOR REPLACEMENT BEARINGS, SEE YOUR HYATT INDUSTRIAL BEARINGS DISTRIBUTOR

GM GENERAL MOTORS

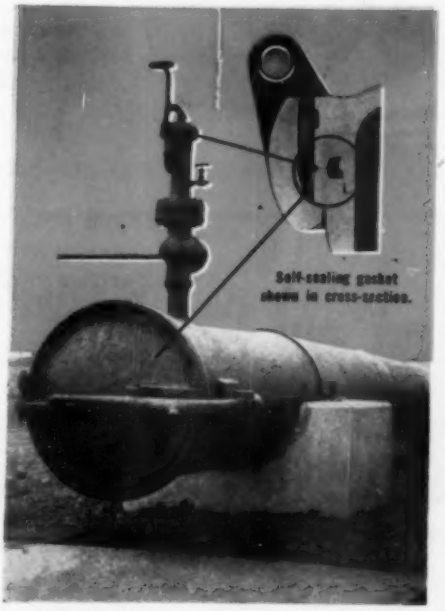
HYATT HY-ROLL BEARINGS
FOR MODERN INDUSTRY

If you are a pipeliner

you'll appreciate this self-sealing gasket in UNIBOLT scraper trap and blowdown closures

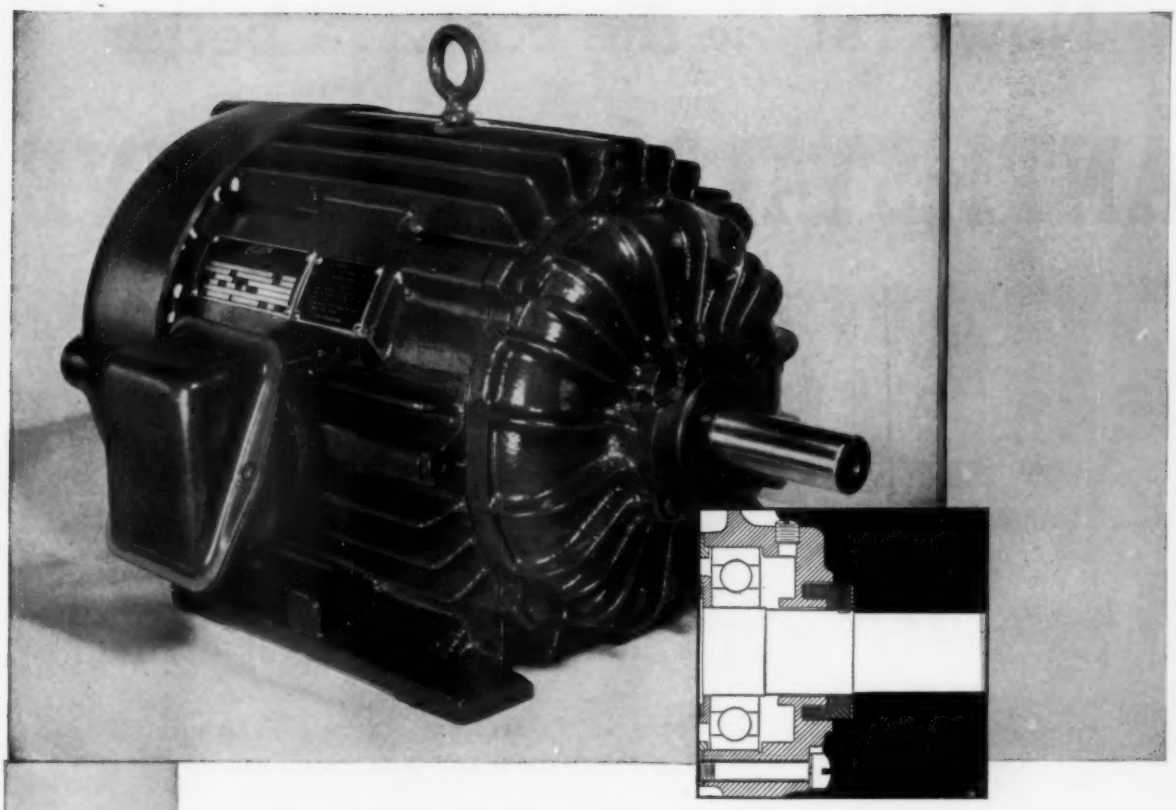
Little things . . . like the gasket for a scraper trap or blowdown closure for example . . . can be a big headache. But not this one. It is the self-sealing gasket used in UNIBOLT pipeline couplings. The UNIBOLT design makes line pressure do the sealing. And this design practically encloses the gasket in steel so that when the closure is opened and closed the gasket is hardly disturbed. Made of oil- and gas-resistant Hycar nitrile rubber, this gasket will last indefinitely under normal conditions.

UNIBOLT scraper trap and blowdown closures are hinged for easy operation. Release only two bolts and the closure swings open and shut like a door. No heavy lifting. No time-consuming multi-bolt flanges. Write for complete information.



THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas



Securely sealed for low maintenance —

TOTALLY ENCLOSED FAN COOLED MOTORS

Century

When motor maintenance goes down, production goes up. Century TEFC Motor *protects itself* from dust, grit, chemical fumes, moisture. Shaft openings at each end are labyrinth-sealed, and there is a precision clearance between metal seal and bearing bracket.

Outside, a hose or whisk broom quickly cleans it. External fan forces jets of cooling air across the frame. Inside, vital motor parts are completely sealed off from injurious atmosphere. Factory lubrication of bearings is adequate for several years' service under normal conditions; however, whenever required bearings may be relubricated through grease plugs.

For full facts on your specific application, call the Century District Office or Authorized Distributor nearest you.

CENTURY . . . building TEFC Motors for 25 years

CE-66R

Performance-Rated© MOTORS 1/20 to 400 H.P.

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri • *Offices and Stock Points in Principal Cities*

Now... at 1/10 the cost... a better

ANTI-STALLING ADDITIVE

GULF AGENT 178

... proved by over 25 billion miles of stall-free driving!

GULF AGENT 178 provides economic, effective anti-stalling performance in motor gasolines. At the same time, it affords corrosion protection at no extra cost.

Look at what GULF AGENT 178 offers you:

PROVED PERFORMANCE—GULF AGENT 178—long recognized as an outstanding corrosion inhibitor for all types of petroleum products—is now used by major refiners in modern volatile motor gasolines to eliminate stalling caused by carburetor icing . . . and its effectiveness for this use has been proved in service by over 25 billion miles of stall-free driving.

LOW COST—Small concentrations—15 to 25 pounds per thousand barrels—give anti-stalling protection at as low as 1/10 the cost of commonly used de-icing additives.

EASE OF USE—GULF AGENT 178 is readily soluble in all petroleum products—can be easily blended at temperatures ranging from minus 30 to plus 140° F. Also, it is insoluble in water and can be handled in conventional gasoline transfer systems with no danger of loss from water leaching.

MINIMUM STORAGE—The small concentrations required eliminate need for expensive additive storage.

EXTRA BENEFITS—Rust protection it provides lengthens life of distribution and storage facilities from refinery to customer.

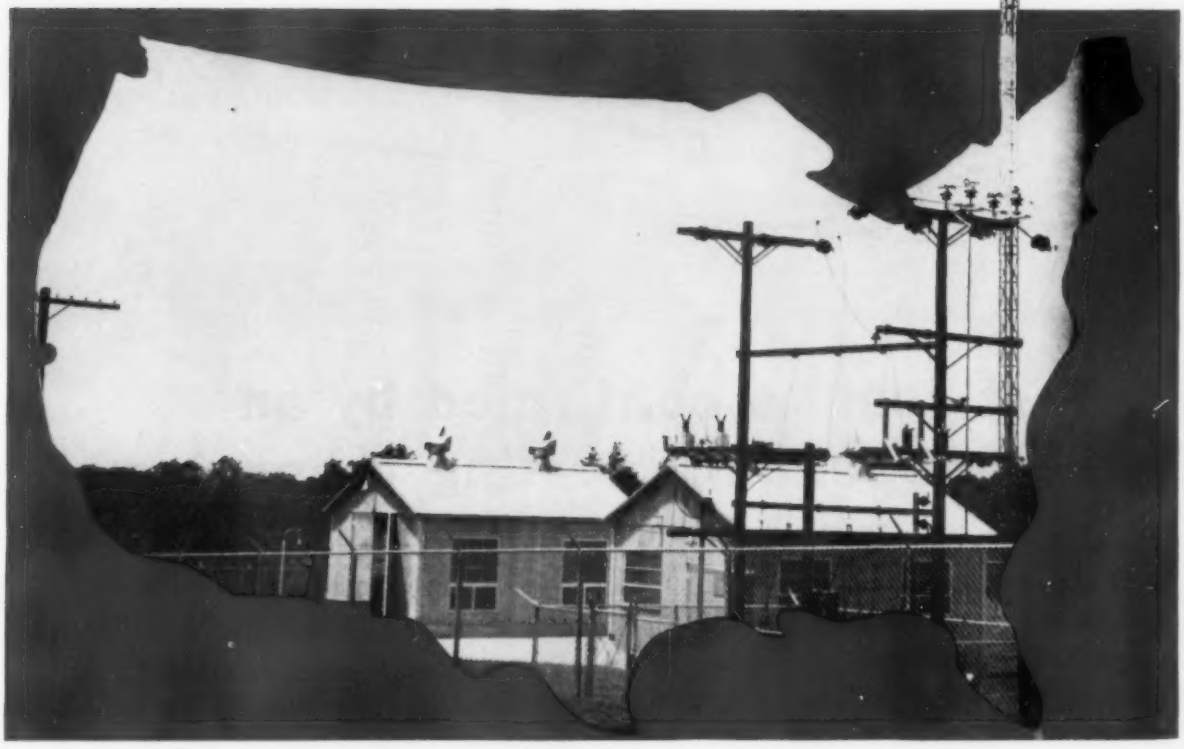
Let us demonstrate GULF AGENT 178 in your gasoline!

Petrochemicals Department
GULF OIL CORPORATION
Gulf Building
Pittsburgh 30, Pennsylvania

QUALITY CHEMICALS *from* PETROLEUM

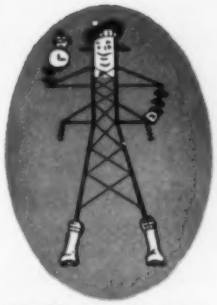
GULF

ELECTRIC POWERED MICROWAVE CONTROLLED PIPELINE STATIONS NOW SPAN AMERICA...



One of many ways progressive management puts UTILITY ELECTRIC POWER to work

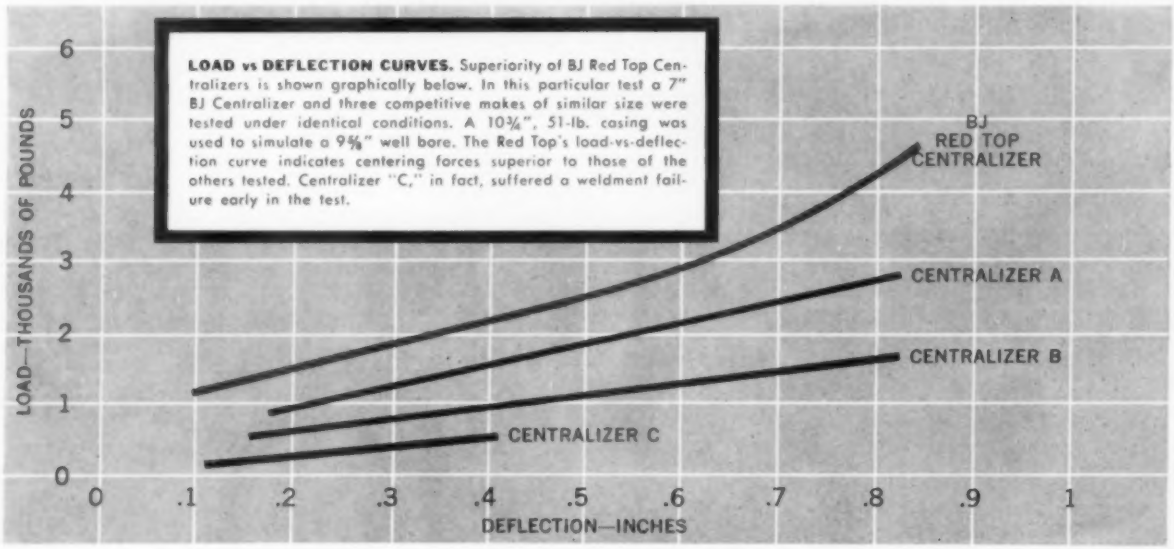
If you are in the pipe line transmission business . . . or if you contemplate having anything to do with pipe line transmission operations, don't sign any contract for power until you have carefully investigated the advantages of UTILITY ELECTRIC POWER. Of the 686,000 miles of pipe line systems in America, a big percentage of these is operated by Electric Power. When you have deliveries to make – at low cost – do it the modern, progressive way. Use UTILITY ELECTRIC POWER.



I'M LCP – Low-Cost Power on the Job 24 Hours Daily

PETROLEUM ELECTRIC POWER ASSOCIATION
P. O. BOX 35006 DALLAS, TEXAS

BJ Centralizers


LOAD vs DEFLECTION CURVES. Superiority of BJ Red Top Centralizers is shown graphically below. In this particular test a 7" BJ Centralizer and three competitive makes of similar size were tested under identical conditions. A 10¾", 51-lb. casing was used to simulate a 9⅝" well bore. The Red Top's load-vs-deflection curve indicates centering forces superior to those of the others tested. Centralizer "C," in fact, suffered a weldment failure early in the test.
LOAD—THOUSANDS OF POUNDS
0
1
2
3
4
5
6
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1
DEFLECTION—INCHES
BJ RED TOP CENTRALIZER
CENTRALIZER A
CENTRALIZER B
CENTRALIZER C

Test results confirmed by an independent testing laboratory

Now for the first time there is tangible evidence of centralizer performance. A series of rigorous tests have been made upon stock samples of representative makes of casing centralizers used in the oil fields throughout the world. These centralizers were put through stresses that simulated the most grueling down-hole conditions. And in every case, BJ Red Top Centralizers outperformed all the competitive models tested.

These outstanding findings were far from accidental. With typical thoroughness, the Byron Jackson Division of Borg-Warner Corporation had subjected the BJ Red Top Centralizers to a battery of tests that were even more stringent than the subsequent independent project. The centralizers underwent several years of exhaustive study, design, tests, redesign, and more tests before they were offered to the petroleum industry.

Meticulous single-spring tests were made by BJ technicians to develop the best individual spring characteristics as well as the optimum resiliency of the assembled units. These tests were possible only because of BJ's exclusive *weldless, rivetless design*, which permits use of a higher quality alloy spring steel.

Only BJ Centralizers have the combination of features that guarantee you an efficient, trouble-free cementing program and maximum protection for your down-hole dollar. Get full particulars from your BJ field man or write Byron Jackson Tools, Inc.

best by test!

These points put BJ Centralizers on top in rugged competition

No load on casing! Springs fulcrum on cage. Casing always rotates freely.

Pre-stressed springs give higher initial load—assure maximum centering force with minimum set.

Rivetless, weldless construction makes possible the use of highest quality alloy spring steel...

Slim design allows easy insertion into the hole.

Hinged design offers quick, simple clamp-on.

End cages can't hit well bore, regardless of side load.

Choice of 1¼", 1½", 1¾" or 2" (color-coded) cambers.

Cambers dimensioned before pre-stressing and assembly. You always get the required assembled o.d.

Positive double retaining feature locks pin with dimple in middle and bend at end.

End of spring is curved so spring-holder can never hit wall.

Self-aligning, weld-on type stop collar furnished for use when centralizer is not located on casing collar.

Big Savings

BJ Red Top Centralizers can be shipped disassembled, offering big savings on shipment costs—particularly for export. Assembly tool available.

Watch for New Companion Tools

WATCH BJ FOR THE NEWEST

Byron Jackson Tools, Inc.

A subsidiary of Borg-Warner Corporation

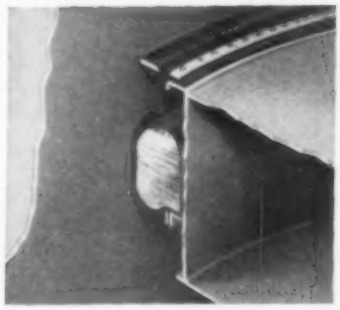
P.O. Box 2017A, Terminal Annex · Los Angeles 54, California

every oil operator wants to know

HOW TO PREVENT LIGHTNING FIRES IN TANKS

the answer is now available

USE HAMMOND TUBESEAL* FLOATING ROOFS!

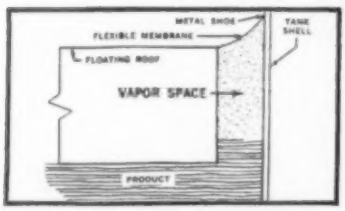


TUBESEALS are made lightning-proof with their exclusive electric conductor weather seal.[1] This specially compounded synthetic rubber, extending continuously around the entire perimeter, between roof and tank shell, provides an infinite number of contact points. ELABORATE TESTING by an independent laboratory[2] discloses that the seal prevents isolation and collection of static electricity charges, providing a continuous conductive surface with large current carrying capacity. Induced charges from lightning are immediately dissipated and fires are prevented. There are no mechanical contacts to cause sparking.

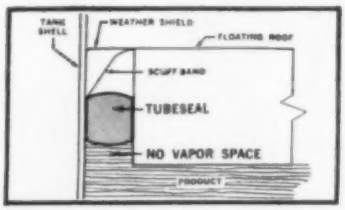
WITHOUT VAPOR THERE CAN BE NO FIRES **. . . the inherent design and construction of Hammond Tubeseals eliminates space between roof, shell, and liquid; thus, there is no room for vapor to form . . . no vapor . . . no fires . . . no evaporation . . . no corrosion!**

Introduced to the oil industry late in 1955, the Hammond Tubeseal found immediate favor with oil companies all over the world . . . there are now more than 200 installations in operation and building. A measure of their conservation values and fireproof features is illustrated by their record of repeat orders from satisfied users—one large oil company, after several test installations, re-ordered more than a score of Tubeseals. The same story of satisfaction exists wherever a Tubeseal is in operation.

Write for bulletin TS



CONVENTIONAL FLOATING ROOF tank has space below flexible membrane where air-vapor mixtures form. Because metal shoe and membrane cannot be absolutely gas tight, vapor is constantly escaping. This condition causes excessive corrosion, may also result in rim fires from lightning or other source.



HAMMOND TUBESEAL FLOATING ROOF entirely eliminates every space where air-vapor mixtures can form. Hammond Tubeseal completely fills space between product surface and roof seal, so that corrosion is stopped (even for sour crudes), and vapor cannot form—hence cannot ignite or be lost.

THE HAMMOND TUBESEAL
for new or old floating roof tanks,

FEATURES

- **lightning and fire proof construction**
- **no moving parts**
- **no mechanical maintenance**
- **climate-proof**
- **non-corrodible**
- **can operate to bottom of tank or above the top**
- **no vapor space below the seal**
- **entire circumference has tight seal under pressure at all times**
- **longer working life expectancy**

*Patented [1]patent pending [2]names on request

HAMMOND TUBESEAL — THE MOST EFFICIENT AND POSITIVE SEAL KNOWN

HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH • CASPER, WYO. • BIRMINGHAM, ALA.

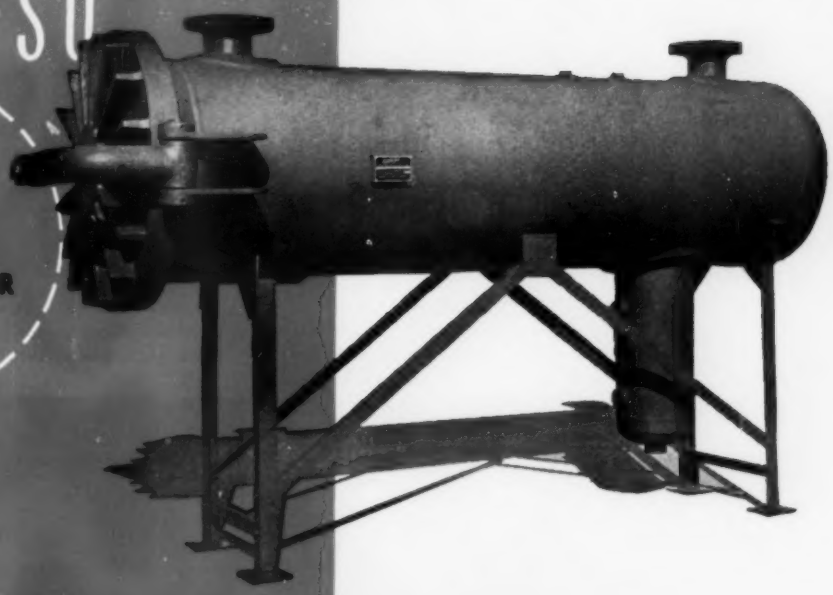
Sales Offices:

NEWARK 2, N. J. • BOSTON 10, MASS. • BRIDGEPORT, CONN. • CINCINNATI 2, OHIO • CHICAGO 3, ILL. WARREN, PA. • BRISTOL, PA. • ARLINGTON, VA. • GREENVILLE, S. C. • BIRMINGHAM, ALA. SAPULPA, OKLA. • PROVO, UTAH • CASPER, WYO. • LOS ANGELES 57, CALIF. • HAVANA • MEXICO CITY "TIPSA," BUENOS AIRES • CAIRO, EGYPT • PORT-AU-PRINCE, HAITI • LIMA, PERU

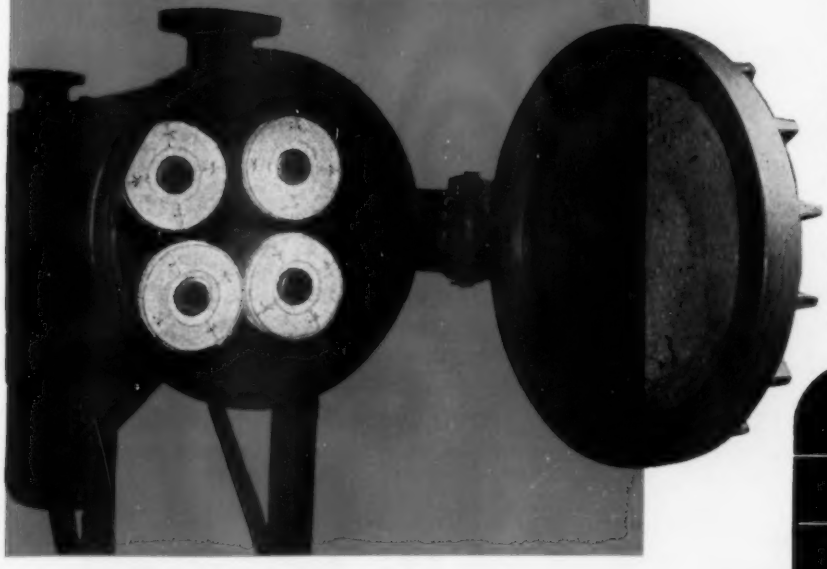
Licensees: CALIFORNIA, CANADA, ENGLAND, BELGIUM, GERMANY, ITALY, FRANCE, AUSTRALIA, JAPAN

EXCEL-SO

HP-700
CLUSTER
REPACK
SEPARATOR
STRAINER



. . . the only high volume pipeline strainer that removes free water from petroleum products!

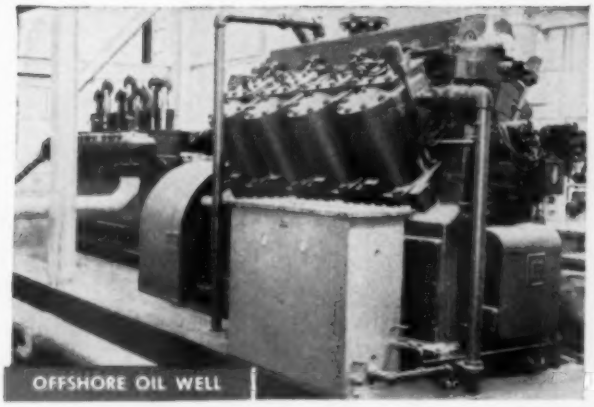


The HP-700 is rated from 750 to 1000 GPM on gasoline and fuel oil. The four repack cartridges provide a total filtering area of approximately 5,500 square inches. This Separator-Filter effectively removes solid particles down to forty microns in size. Equipped with quick opening closures and other easy service features, this compact unit is designed especially for the pipeline industry. Write for detailed information.

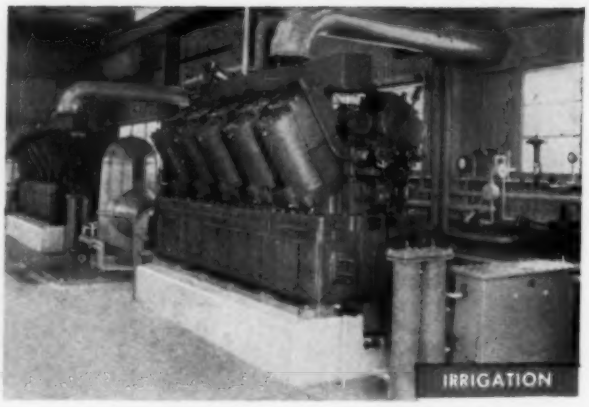
WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

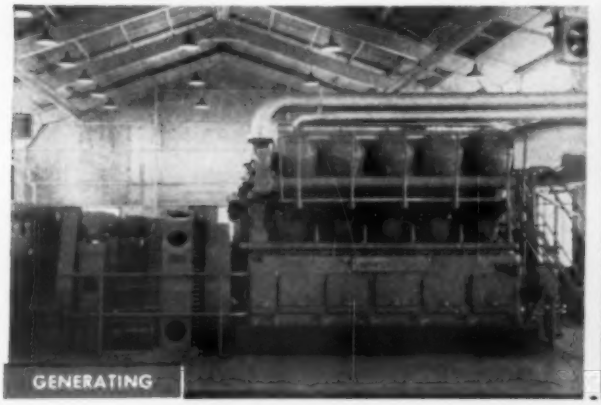
DIVISION OF **FRAM** CORPORATION



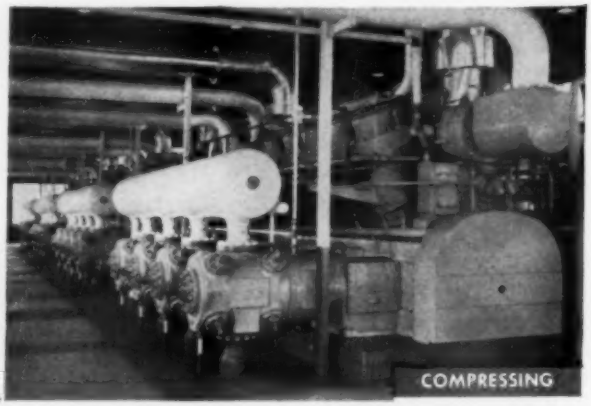
This 295-hp PJVG gas engine is mounted on a platform in the Gulf of Mexico driving a reciprocating crude oil pump. PJVG engines are built in 220 and 295-hp sizes.



The 680-hp PSVG units above are driving Ingersoll-Rand centrifugal pumps on a large irrigation project. PSVG gas engines cover the 408-816-hp range.



This 1100-hp PKVG is shown at the task most frequently assigned to I-R power units: a-c generator drive is a natural for smooth-running I-R 4-cycle gas engines. PKVG's are available from 880 to 1760 hp.



All I-R gas engines are also offered in integrally-built engine-compressor units. Above are 2000-hp turbo-charged KVS compressors on gas transmission. 4-cycle engine-compressors are available from 120-2000 hp.

POWER for any purpose

gas engines deliver heavy-duty power economically

Whatever the task, Ingersoll-Rand heavy-duty 4-cycle gas-engine equipment offers the highest dependability, flexibility and long-run economy. Built for 24-hour-a-day, continuous operation on a wide range of fuels, these engines are especially suitable where close control is important (such as a-c generator drive). Where I-R power units and their companion engine-compressors are used together, the similarity of operation and the interchangeability of parts effects additional important economies. Contact your I-R representative now for more information.

4-CYCLE

Ingersoll-Rand

11 Broadway, New York 4, N.Y.

COMPRESSORS • GAS AND DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR AND ELECTRIC TOOLS

With drilling costs up where they are,

Only the Most Accurate Mud Log Is Worth Using

A Baroid mud-and-cuttings-analysis log gives you immediate, *direct* detection of oil and gas *while you are drilling.*

No other comparable mud logging method can equal a Baroid log for accuracy, because *only* Baroid has the exclusive hydrogen reactor and gas collimator. These techniques eliminate erroneous gas shows caused by corrosion or wet gas, or false oil shows caused by oil in the mud, all of which make accurate interpretation difficult.

Be sure you do not pass up any possible production. You can be sure . . . if your mud log is by Baroid.

Baroid has led from the first

- With every new technique.
- In every active oil area.
- For accuracy of logging.

BAROID

WELL LOGGING SERVICE

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

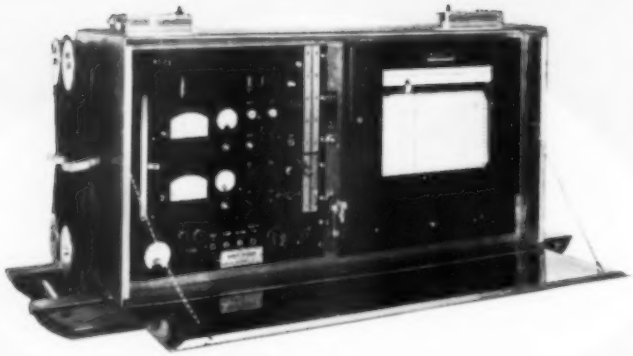
5792

an

ELECTRONIC WATCHMAN

running 24-hour tours

BAROID *automatic recording* GAS DETECTOR



with exclusive new gas collimator

Like an "electronic watchman," Baroid's automatic recording gas detector watches around the clock, detecting and recording gas zones as they are penetrated by the bit. It helps the geologist tell immediately which zones to DST, core, or perforate. Whenever there is a gas build-up, this "electronic watchman" sounds an alarm horn against a possible blowout.

Easily installed, maintained and operated, Baroid's compact gas detector can be set up near the flowline, in the geologist's field trailer or sample house, for wellsite information.

An integral part of this field-proved detector—at no extra cost—is the exclusive new GAS COLLIMATOR. This completely automatic instrument eliminates wet gases, provides dependably accurate methane readings under all conditions, and like the Detector works for days without adjustment.

BAROID DIVISION • NATIONAL LEAD CO.
P. O. Box 1675, Houston 1, Texas

Please send me your Gas Detector bulletin.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

BAROID

WELL LOGGING SERVICE

BAROID

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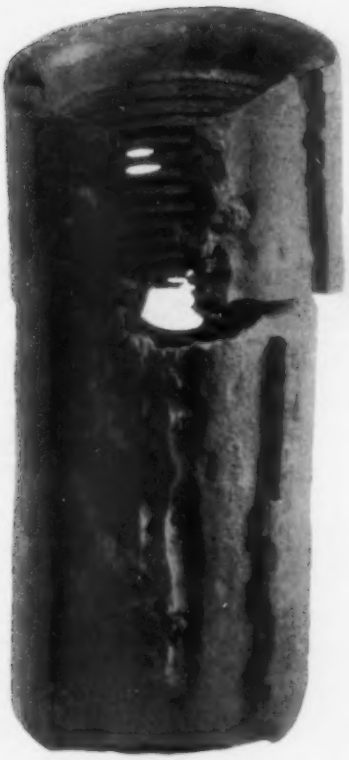


BEFORE RODINE was adopted. Note the complete breakdown of the walls of the down-well tubing and casing.

AFTER RODINE was put to use. Though the well is highly acidic, little corrosion of the tubing and casing occurs now.

ACP Rodine® INHIBITS CORROSION IN SWEET WELLS, CONDENSATE WELLS, AND SECONDARY RECOVERY OPERATIONS—COSTS ONLY PENNIES A DAY

For just a few pennies a day you can minimize corrosion that costs you thousands of dollars annually. ACP Rodine will inhibit corrosion, cut maintenance and replacement costs, help prevent loss of production. It is readily soluble in water and brine, is effective over 200°F, can be added to the well by slugging (since it is heavier than the crude, it rapidly sinks into the water layer at the bottom of the well), or by proportioning pumps. And it does not promote or stabilize emulsion.

Specify whether your corrosion problem is in sweet wells, condensate wells, or secondary recovery operations. We'll send technical data and samples. Or our field engineering staff will cooperate with you in corrosion studies, including coupon service and fluid analysis.

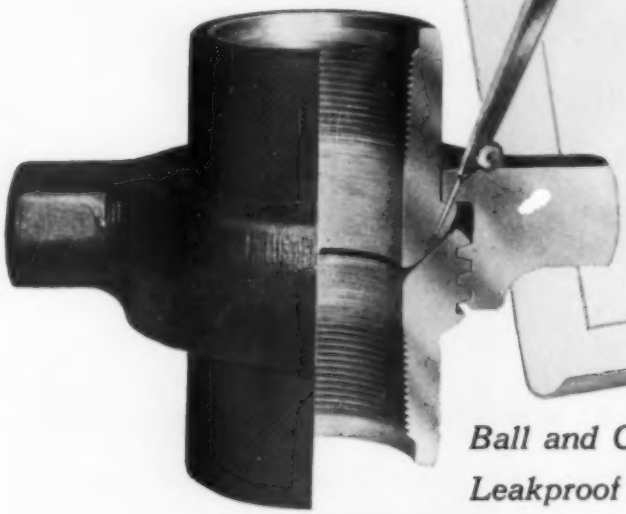
AMERICAN CHEMICAL PAINT COMPANY, Ambler 39, Pa.

CHEMICALS ACP PROCESSES

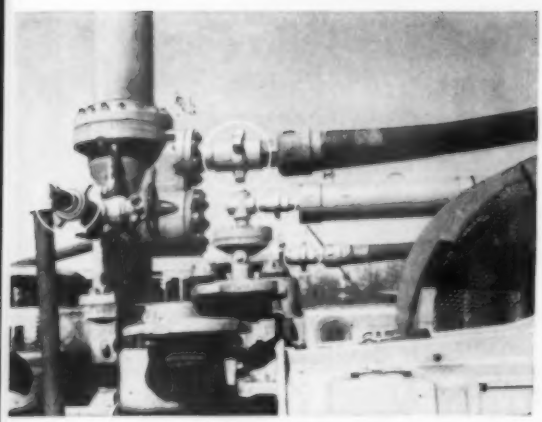
DETROIT, MICH. • ST. JOSEPH, MO. • NILES, CALIF. • WINDSOR, ONT.

New Chemical Horizons for Industry and Agriculture

Perfect sealing is a matter of engineering principle with WECO unions



Ball and Cone Seat Design Provides Positive Leakproof Seal for High or Low Pressures.



For 23 years, WECO Unions have set the standard for the industry; have stayed out in front because of a fundamentally correct engineering principle—the ball and cone design that prevents leaks under high pressures, shock, surge or vibration.

With the spherical male part seated in a concentric circle in a mirror-finished conical female part, unequaled metal-to-metal sealing is obtained time after time, every time.

In addition, WECO Unions have stronger subs and wing nuts, heavier wall construction and sturdy Acme threads. Thus, they stand up on the toughest jobs, continue to operate with easy efficiency under extremes of pressures, volumes and abrasions.

There's a WECO Union for every oil industry service—from the world's most complete line. Available at supply stores everywhere, in sizes from 1" through 12", pressures from 1,000 through 15,000 psi.

U-2-57

WECO®

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

Division of CHIKSAN COMPANY *a subsidiary of*
FOOD MACHINERY AND CHEMICAL CORPORATION

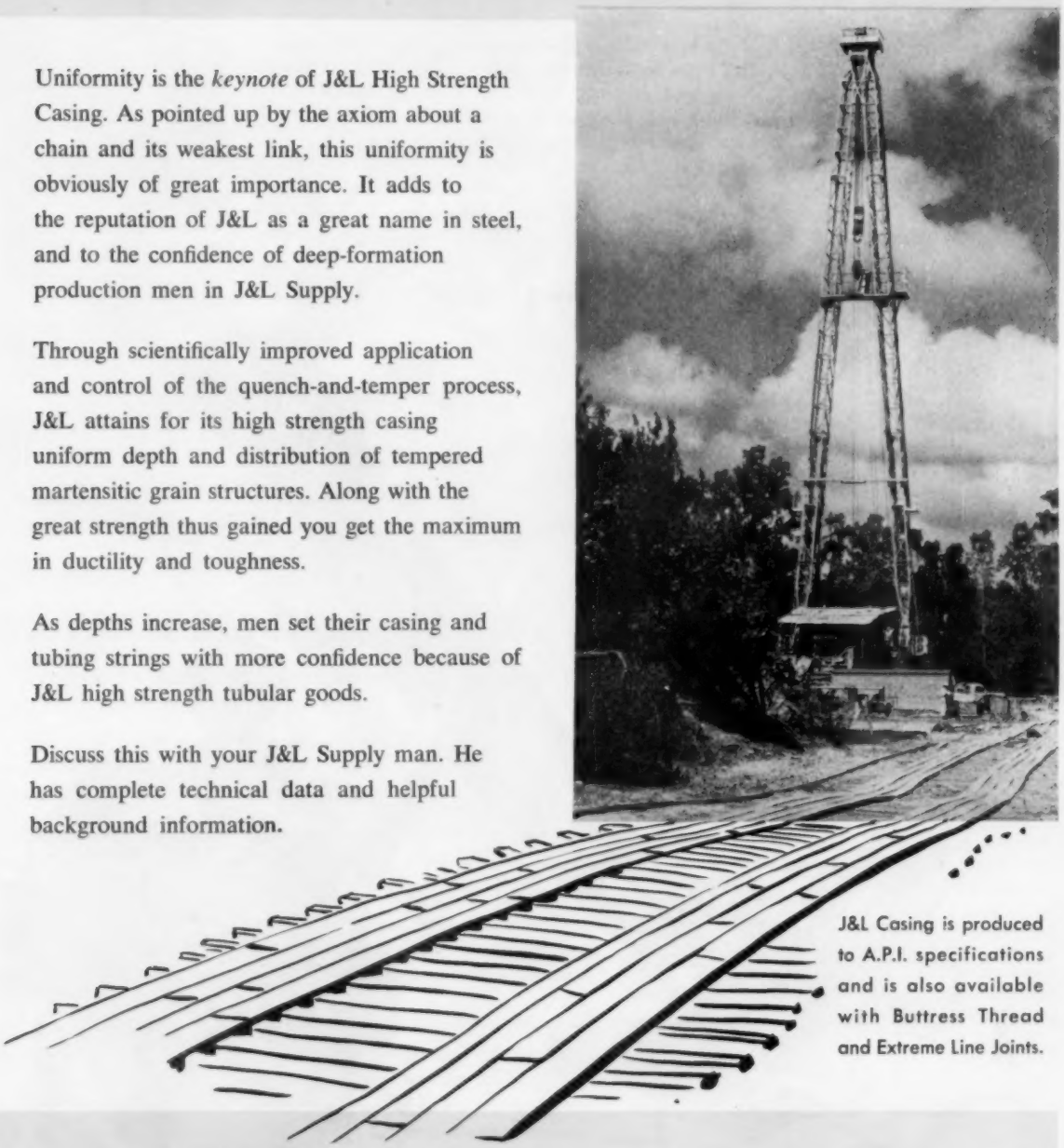
What to expect of
J&L HIGH-STRENGTH CASING

Uniformity is the *keynote* of J&L High Strength Casing. As pointed up by the axiom about a chain and its weakest link, this uniformity is obviously of great importance. It adds to the reputation of J&L as a great name in steel, and to the confidence of deep-formation production men in J&L Supply.

Through scientifically improved application and control of the quench-and-temper process, J&L attains for its high strength casing uniform depth and distribution of tempered martensitic grain structures. Along with the great strength thus gained you get the maximum in ductility and toughness.

As depths increase, men set their casing and tubing strings with more confidence because of J&L high strength tubular goods.

Discuss this with your J&L Supply man. He has complete technical data and helpful background information.



J&L Casing is produced to A.P.I. specifications and is also available with Buttress Thread and Extreme Line Joints.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

J&L – A GREAT NAME IN STEEL

46

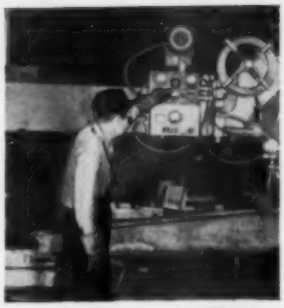
UNIONMELT Welding
makes rugged seams for rugged machines

Tough and heavy road-building machines are no stronger than the welds that hold their working parts together. Making sound joints in thick steel is a job made to order for LINDE's UNIONMELT Submerged Melt Electric Welding.

Using UNIONMELT Welding, you get dense, deep welds in metal up to 1½ inches thick in a single pass. There's no limit to thicknesses you can join with multiple passes. Welds are uniformly clean and smooth. With the right combination of UNIONMELT Composition and welding rod, alloy steels and even non-ferrous alloys can be welded as easily as steel—manually or automatically.

Get all the facts about UNIONMELT Welding, and LINDE's other modern welding methods. For a free copy of the booklet, "Modern Methods of Joining Metals," address Dept. 0-93. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

FOR THE BEST IN ELECTRIC WELDING—LOOK TO LINDE!

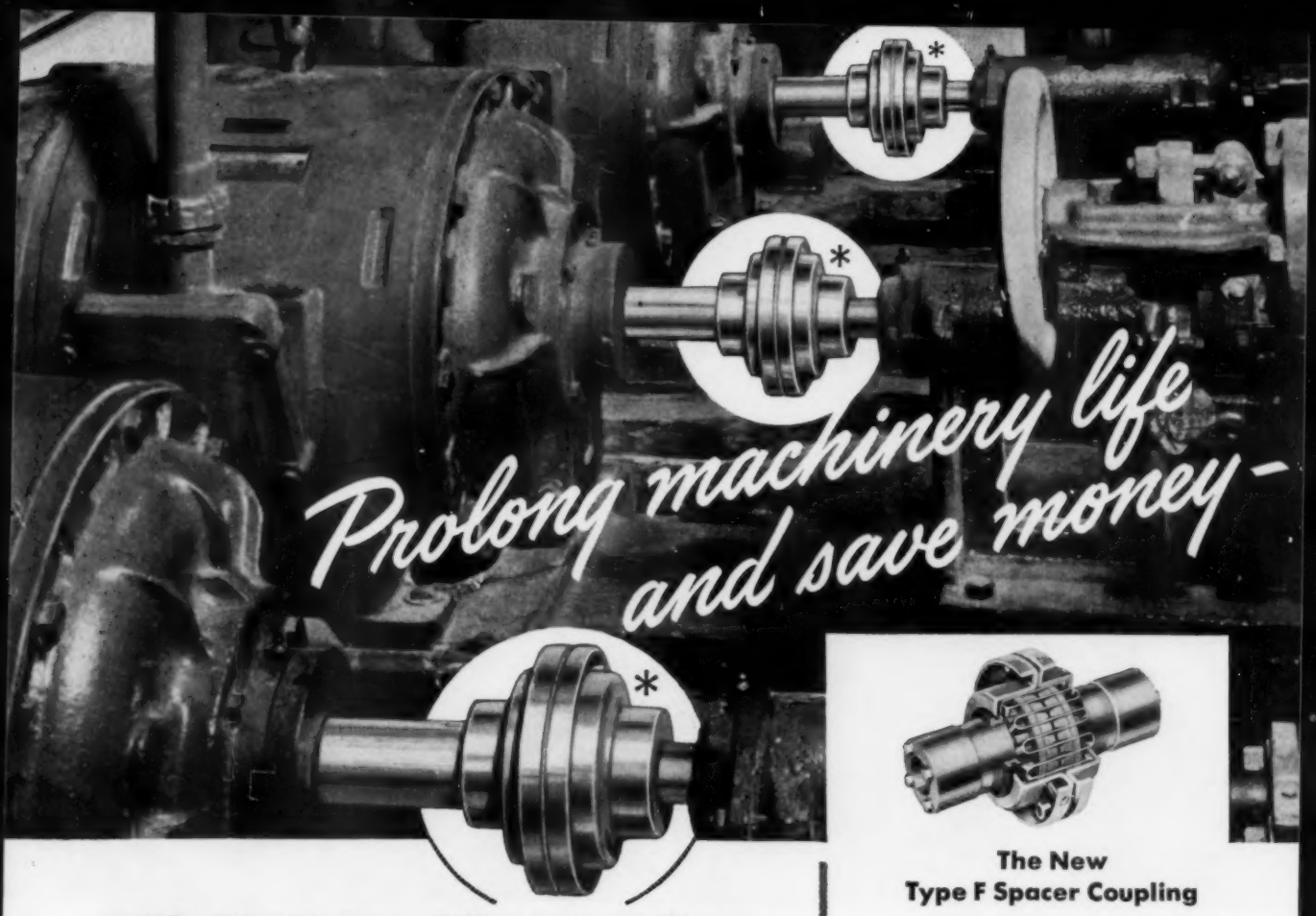


LINDE's UNIONMELT Welding gives dense, sound welds in light-gage or heavy metals, at high speeds, automatically or manually.

Linde
TRADE-MARK

UNION CARBIDE

The terms "Linde," "Unionmelt," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.



Prolong machinery life and save money—

with FALK Steelflex Couplings

Ever since the first Falk Steelflex Coupling was designed and built, we have firmly held to these beliefs:

1. A coupling, to give fullest value, must do more than merely *connect* driving and driven machinery—it must *protect* the machinery and prolong its life.

2. A coupling, to be truly flexible, must overcome the effects of shock and vibration, as well as shaft misalignment.

Proof of the soundness of those beliefs is furnished by the record. More than one million Falk Steelflex Couplings have been used on every conceivable type of industrial application . . . giving trouble-free service, providing maximum protection to connected machinery.

* A single basic type—the famous Type F—fills 90% of all industrial application needs. It is versatile, efficient and economical. And—it is always available from factory, field or distributor stocks, in a wide range of sizes.

Write to Department 247 for engineering bulletin, including selection and dimension tables.

THE FALK CORPORATION, MILWAUKEE, WISCONSIN

MANUFACTURERS OF:

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

FALK

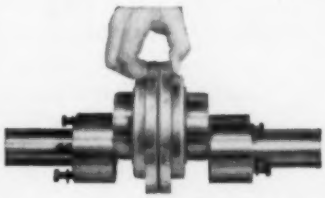
...a good name in industry

The New Type F Spacer Coupling

Here is a Steelflex coupling specially designed to permit fast, easy installation and removal in horizontal and vertical applications where it is impracticable to move the connected units—or where a space-gap (up to 12 in.) is necessary.

Like all Steelflex couplings, the Type F Spacer gives long, trouble-free service and maximum 3-way protection for connected machinery: it provides torsional resilience to reduce shock and vibration; it accommodates parallel or angular shaft misalignment; it allows free (or limited) end float.

An outstanding feature of the Steelflex Spacer is that it can be installed or removed in one piece (see photo below); no dismantling or servicing of the coupling is required. Pump assemblies can be disconnected and removed without disassembling the coupling, without exposing working parts.



The Steelflex Spacer coupling is prelubricated at the Factory and can be installed, or removed and reinstalled, without disturbing the lubricant—a highly desirable feature.

They Keep Oil on the Move

The Bethlehem pumps installed in this trunk pipe line were chosen for their ability to keep oil on the move—week after week, month after month. The neat, well-kept units shown above are powerful U-510's. Like all Bethlehem general-service pumps, they are backed by excellent field service and local supplies of parts—twin guarantees of first-class performance.

The U-510 is one of the five sizes of general-service pumps manufactured by Bethlehem. Three are the duplex type; the others are triplex. They're precision-engineered units that do a whale of a job in lease gathering and pipe-line work, refinery and gasoline service, etc. This line of pumps is also highly suitable for water-flooding, salt-water disposal, and service around the drilling rig. Pressure, capacity, and fluid handled are the factors that determine the actual choice of unit.

No matter which pump is selected, you are assured of advanced design and top-quality workmanship. Power ends are built for continuous full-load rating. Complete lubrication is furnished by a positive, gravity-flow system that functions perfectly at all operating speeds. Fluid ends (available in alloy-iron, steel, or aluminum-bronze) are engineered for the toughest service ever encountered.

The pumps are so versatile, so adaptable to conditions, that you can employ them on job after job. Call us for more details; we'll see that you get complete information.

Bethlehem General-Service Pumps

Model	Type	Plunger Load, Lb	Input Hp	Bore & Stroke, In.
U-33	Duplex	2400	13 @ 160 rpm	1¼ to 3 x 3
UA-46	Duplex	5000	40 @ 120 rpm	2½ to 4 x 6
U-510	Duplex	12000	100 @ 75 rpm	3 to 5½ x 10
TP-3	Triplex	3580	36 @ 400 rpm (max)	1¾ to 2¼ x 3
TP-4	Triplex	5000	67 @ 400 rpm (max)	2 to 4 x 4

BETHLEHEM STEEL

BETHLEHEM SUPPLY COMPANY

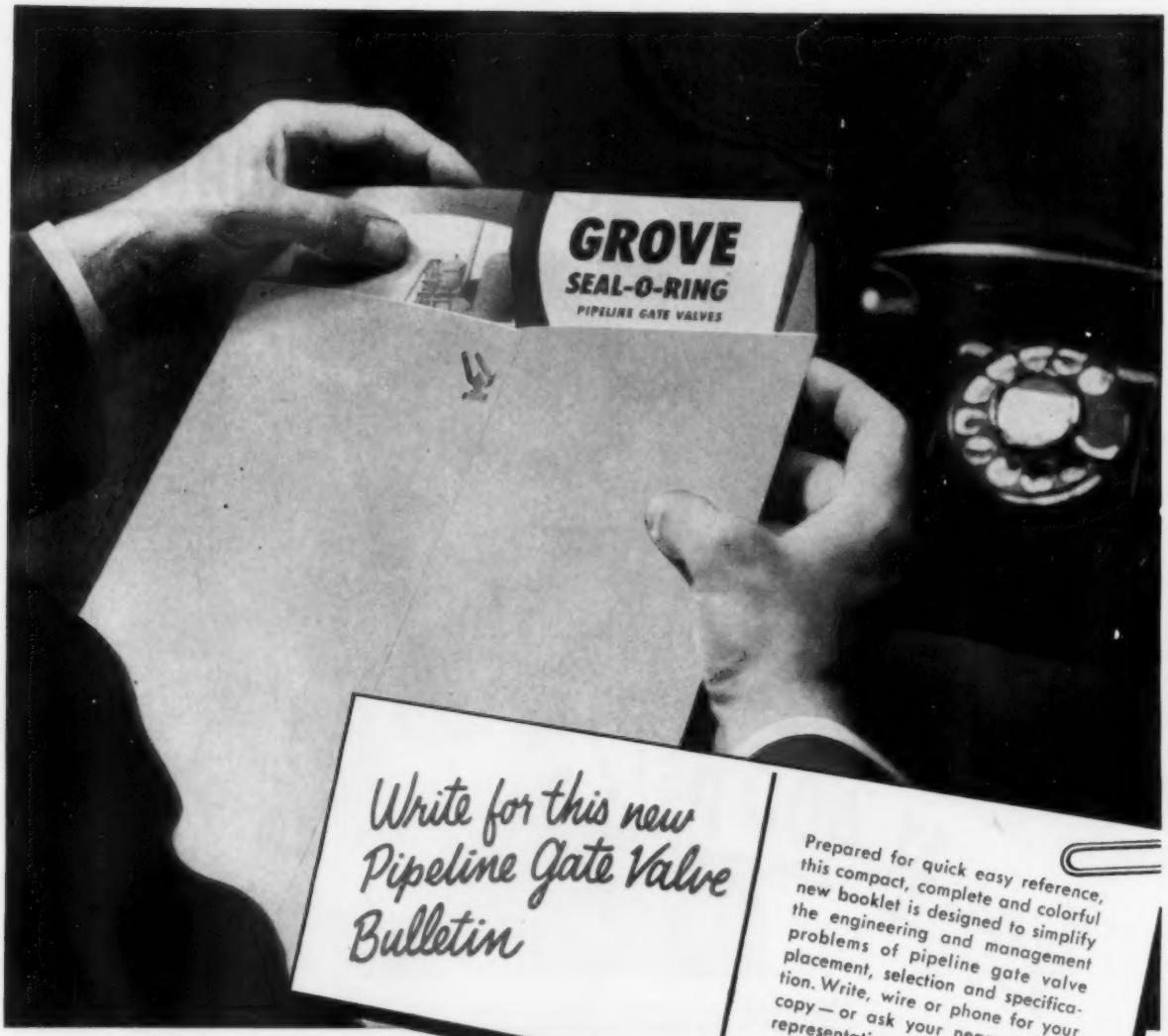
General Offices: 21 E. Second St., Tulsa, Okla.

West Coast Headquarters: Los Angeles, Calif.

Canadian Distributor: Bethlehem Supply Company of Canada, Ltd. Calgary, Alberta, Canada

Export Distributor: Bethlehem Steel Export Corporation 25 Broadway, New York, N. Y.

BETHLEHEM SUPPLY



Write for this new Pipeline Gate Valve Bulletin

Prepared for quick easy reference, this compact, complete and colorful new booklet is designed to simplify the engineering and management problems of pipeline gate valve placement, selection and specification. Write, wire or phone for your copy — or ask your nearest Grove representative.

packed with...

VALUABLE INFORMATION on valve design, testing and operation

COLORFUL ILLUSTRATIONS of valve types, construction and features

CHARTS AND GRAPHS to aid in venturi type valve applications

DIMENSIONAL TABLES covering 6" to 36" valves in ASA Series 150 to 600, WOG

MATERIAL SPECIFICATIONS for the exclusive Grove Seal-O-Ring Fabricated Steel Gate Valves

705

GROVE SEAL-"O"-RING Gate Valves

SUBSIDIARY OF WALWORTH

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GROVE SEAL O RING ® GROVE SIMPLICITY ACCURACY SAFETY

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HIGHEST WELL PRESSURE EVER!

—Certified by MARSH

This was oil country drama at its best: bringing in the "2 Elue Roach" well in Union Oil & Gas Corporation's spectacular Lake Arthur Field at Jefferson Davis Parrish, Louisiana. The Marsh Gauge climbed to 11,400 psi; later reached 11,600 psi—highest shut-in tubing head pressure ever registered by an oil well, and by a good margin.

Only a few years ago oil companies were refusing to complete wells that threatened pressures of even 10,000 psi. But stronger casings, and techniques developed by Union in dealing with ever higher pressures in the Lake Arthur Field, had made "2 Elue Roach" a producing reality.

It took a lot of doing—a lot of programing and qualifying of materials—to bring in the Roach Well and the new era it foretells. So it is not surprising to see a Marsh Gauge at the top of the Christmas Tree.

Yes, wherever oil flows Marsh is at the top of the list. In the Mastergauge everything that can contribute to gauge accuracy and dependability has been brought to a higher stage of development:

—One-piece leak-proof construction of socket, tube and tip by the exclusive Marsh "Conoweld" process.
—Sturdy "Marshalloy" case of boiler-plate thickness steel; copper clad inside and out.
—Precision movement with unduplicated plus features like the "coined" sector gear.
—Stainless tubes and sockets available for any corrosive service.
—Finally, the famous Marsh "Recalibrator" to keep the gauge always accurate.

Ask for new catalog covering Marsh instruments.

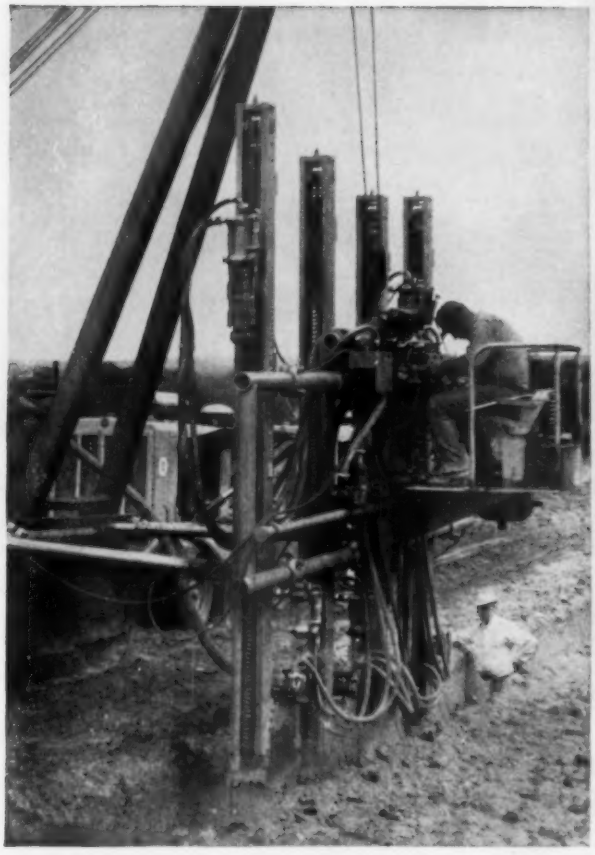
An interesting account of the method of completing the "2 Elue Roach" will be found in the February 11 issue of Oil & Gas Journal. Depth of well is 15,461 ft. Well tested 190 bbl. of condensate and 6,375,000 cu. ft. of gas daily.

MARSH INSTRUMENT CO. *Sales Affiliate of Jas. P. Marsh Corp.* **Dept. L, Skokie, Ill.**
Marsh Instrument and Valve Co. (Canada) Ltd., 8407 103rd St., Edmonton, Alberta
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

MARSH GAUGES

"THE STANDARD OF ACCURACY"

GAUGES • WATER REGULATING VALVES • SOLENOID VALVES • HEATING SPECIALTIES



GARDNER-DENVER "TWINDRIL"—twin drilling power that sinks fast, clean holes and keeps pipeline trenching on the move through rock.

GARDNER-DENVER "QUADRIL"—all four heavy-duty drills are operated—by only one man—by hydraulic remote controls from the seat.

For faster moving trench miles . . .

take a Gardner-Denver "Quadril." Have the hard-hitting blast hole drilling power so many pipeline contractors depend on. The "Quadril" downs four holes at a time with one man at the controls. Saves three men and a tractor, gets the job done faster. It is reported one "Quadril" and one operator can more than double the footage obtained with the "Twindril."

Use the Gardner-Denver "Twindril"® where it fits—on smaller jobs . . . where rock drills faster . . . or short stretches of rocky trench. Like the "Quadril," it's fast acting, easy to operate and keeps trench miles moving ahead.

Write today for complete information on Gardner-Denver multiple unit pipeline drills.

ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER-DENVER

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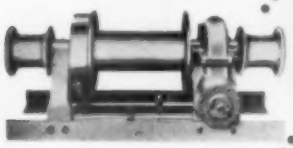
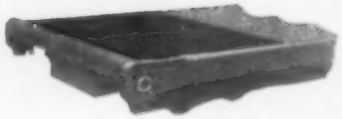
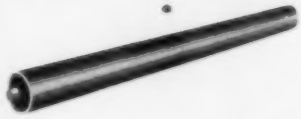
LELAND'S "PACKAGED UNIT"



Flush Mounted Body Deck Plate . . .
2" center-matched hardwood, flush mounted, tempered steel — lightweight but durable. Recessed snatch-block toggle in tail board, pole trailer bolster hole.





Rolling Tail Pipe . . .
Seamless hydraulic tubing mounted on shielded ball bearings, encased in special castings.

Headache Rack . . .
For absolute safety for operator, cab and winch. Heavy duty, 2½" & 3½" hydraulic tubing, flawlessly welded, mounts spare wheel and tire carrier.

Winch Mounting Brackets . . .
For complete adaptability to all winching jobs — means great strength and safety . . . heavy duty Tulsa winches, too, upon request.

Gin Pole Pocket Settings . . .
2 recessed gin pole settings, one-piece steel castings, for double or single gin-pole operating — act as bearing housings for rolling tail pipe — complete with gin poles.

for rough, off-the-road work

The heavy demands of pipe line construction have been met and conquered by Leland's "Packaged Unit"—the ultimate in trouble-free performance wherever rugged operating conditions prevail. Your next construction job *deserves* a Leland "Packaged Unit".

Don't forget Leland's *other* construction specials . . . FIFTH WHEEL BODY—POLE TRAILERS—SELF-LOADING SINGLE AXLE TRAILER—TANDEM SELF-LOADING FLOAT.

Leland
EQUIPMENT COMPANY
Oklahoma City • TULSA • Longview, Texas

They Say—

Imports pour into West Coast

"With the West Coast supplying only a little more than two-thirds of its own oil requirements, the Four Corners pipeline will almost surely be insufficient to bring needed imports down within levels considered safe from the standpoint of national security.

"The vast West Coast market already is deficient in supply by a total of some 275,000 bbl. per day, or 60,000 bbl. per day more than the total increased production expected in the entire U. S. as a result of administration-imposed limits (of imports)—even if these limits are fully complied with. The phenomenal growth of West Coast population and industry will bring the area's oil deficiency up to five or six hundred thousand barrels per day within the not-too-distant future. Imports will continue to pour in at expanding rates so long as the district is exempt from restrictions and cut off from domestic supply sources."

Article in the TIPRO Reporter, magazine of the Texas Independent Producers and Royalty Owners Association.

Post speaks for oil industry

"During the June hearings before Senator O'Mahoney's subcommittee, the oil companies were accused, on the basis of a report by the committee's staff, of using the Iranian crisis to grab Middle Eastern oil for themselves; and of taking advantage of the situation to stifle competition in defiance of the antitrust laws. None of this was based on testimony before the committee. Charges were also made that the oil companies had profiteered from the Suez 'oil lift.'

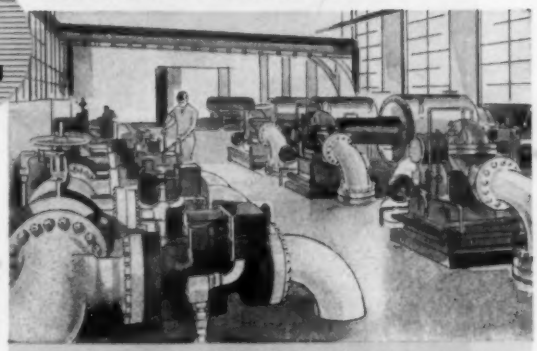
"American oil companies went into Iran, after the nationalization of Britain's oil fields, as a means of keeping Iran's oil out of Soviet hands. They were exempted from antitrust prosecution by the Government for the reason that the companies had to be assured that they would not be prosecuted later for doing what the state department wanted them to do in the emergency.

"As far as the oil lift is concerned . . . (it) . . . is generally regarded as a triumph of American efficient management under peculiarly difficult circumstances. Surely those who directed it, and thus prevented a catastrophic oil famine in Western Europe, deserve something better than the reiteration of

A Solution to Pipeliner Problems

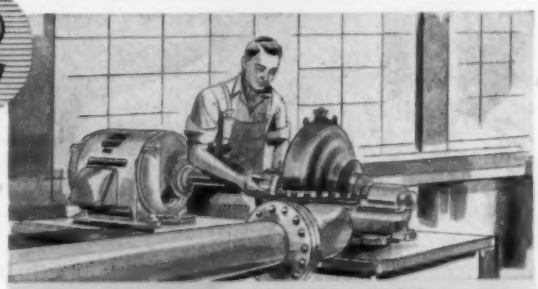
8-B SHAFT SEAL

1 ON HIGH PRESSURES



Specially engineered hydraulically balanced construction permits handling of all pressures encountered in modern pipe lines. Pipeliners report that 8-B Seals in continuous main line pump service for more than 44,000 hours are still in perfect working condition.

2 ON MAINTENANCE MAN-HOURS



8-B Seals are quickly installed. Removal of the top casing on split case pumps is not necessary. Simply slide the entire unit along the shaft into position. Once installed, little or no attention is required. Service-life is long. No messy leakage.

The 8-B Seal is available in a full range of shaft sizes for every main line or tank farm pump service.

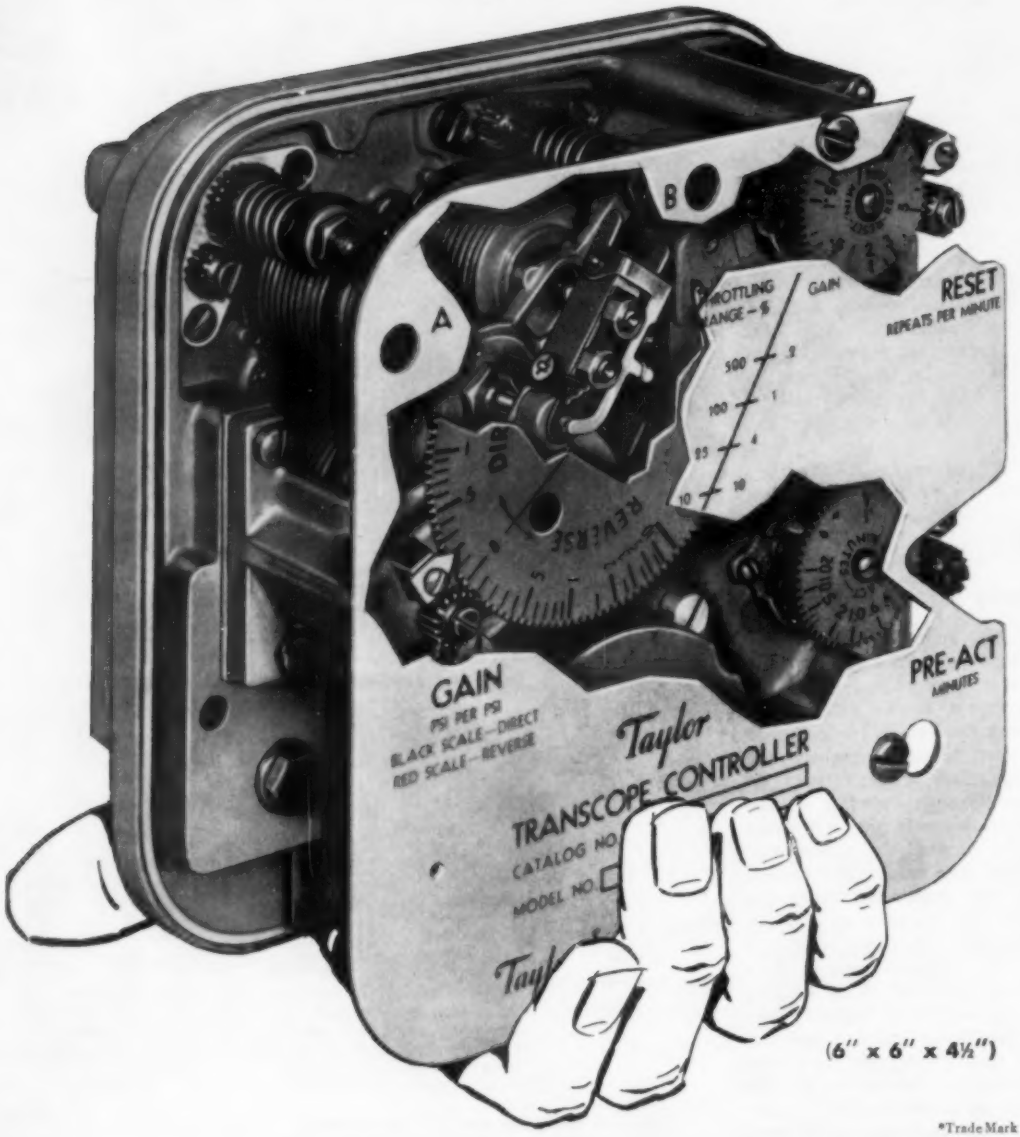
For general information request Bulletin S-215-1. Give mechanical specifications and service details for specific recommendations.

Crane Packing Co., 6419 Oakton Street, Morton Grove, Illinois. (Chicago Suburb). *In Canada. Crane Packing Co., Ltd., Hamilton, Ont.*

CRANE PACKING COMPANY

NEW IN PRINCIPLE . . . NEW IN DESIGN

New Taylor TRAN



(6" x 6" x 4½")

*Trade Mark

Taylor Instruments

. . . NO EQUAL IN PERFORMANCE!

SCOPE* Controller

The last word in Pneumatic Process Control

SUPERIOR PERFORMANCE

1. Especially suited for short spans of measurement . . . ideal for time constants of modern processing . . . outstanding in insensitivity to ambient temperatures.
2. Exceptionally fast and responsive to adjustments—vital on start-ups.
3. Pre-determined mathematical settings made possible by precision manufacture of gain, reset and Pre-Act units. Adjustments stay put.

EXCEPTIONAL ADAPTABILITY

1. Adaptable to changes in process requirements . . . complete interchangeability of components so you can convert from simplest to most complex forms of control *in the field* . . . in minutes.
2. Instrument action reversed by merely rotating a dial. Plugs into Transet Indicators and Recorders or locally mounted manifolds.
3. Designed to meet the demand for more compact instruments, it is ideally suited for use in graphic panels and scanning and logging systems.

SIMPLE MAINTENANCE

1. Rugged bellows assembly, keyed in place, moves the dynamically balanced force plate . . . friction-free bending member never needs maintenance.
2. Husky die-cast aluminum assemblies, accessible stainless steel nozzle and baffle, hardened stainless steel reaction members. Dust and moisture-proof case.
3. Ease of alignment—smooth-acting, screw-driver adjustment because of ball bearing construction.
4. Easy to understand . . . easy to get at . . . simplifies maintenance training.
5. Integral cut-off relay is a built-in feature.

The **Transcope Controller** is so compact, so simple, so smooth and responsive to adjustments yet so accessible for every purpose that it really "gets" you. But the "pay-off" doesn't come until you put it on your toughest job. Only then can you realize how contagious enthusiasm can become.

Write for **Bulletin 98278.** Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

VISION • INGENUITY • DEPENDABILITY

MEAN ACCURACY FIRST

unproved charges dredged out of a report by the committee's staff—a report largely based, as Senator Dirksen brought out during the hearings, on articles in newspapers and other secondary sources."

Editorial in the August 24 issue of Saturday Evening Post.

Cartel in sheep's clothing?

"Let us suppose that all the international oil companies got together and decided to support the domestic oil price by voluntarily restricting imports.

"The man from the Justice Department would be around promptly, and that official looking document would be a charge that they were violating the federal antitrust laws . . . Fortunately, not even the crustiest old tycoon would have nerve enough to propose such a thing.

"But today government officials rush in where tycoons fear to tread. There is a plan afoot under which the large oil companies are to restrict imports on a quota system. And quite a few people nod sagely about what a wise and forward-looking thing it is to do.

"There are, to be sure, certain differences between this plan and the traditional cartel. The oil companies aren't proposing it; in fact, several of them oppose it. Government officials rather than oil company executives are deciding who is to be allowed to import how much and they will decide at what point the market has had enough of a 'lift' to end the restrictions. There is a clear legal distinction.

"Beyond that the difference gets a bit fuzzy. The purpose of this plan is precisely the same as that of any other restrictive arrangement, namely, to support prices. The reasons given are the traditional ones of any cartel—to provide orderly marketing, preserve resources and insure their profitable development, and to protect the national interest. . . .

"The results, too, are guaranteed to be traditional. There will be a tendency to freeze matters within the industry; no company can much improve on its historic position, but it is well protected in this position. Finally, the customer will pay more for the product than he would have had to pay if the restrictive program were not in effect.

". . . The Senate judiciary committee is hardly having hallucinations when it sees in this oil-import plan the 'earmarks' of the old, familiar cartel."

Editorial in the Wall Street Journal.

MEEC answers O'Mahoney

"Activities of the MEEC were at all times carried out in complete good faith and neither by intent nor accident were the laws ever violated or circumvented.

"The most telling point, of course, is that the MEEC succeeded magnificently in its objective of moving badly needed oil to Europe at a time when that continent would otherwise have suffered severely. The committee on interstate and foreign commerce of the House of Representatives, which also held hearings on the oil lift, hailed the work of MEEC as 'a stupendous achievement on the part of the oil industry.'

"It is unfortunate that unfair attacks are being made upon the voluntary efforts of American business to cooperate with their government in coming to the aid of our European friends and allies whose welfare was threatened by the Suez crisis. . . .

"There never was a meeting of either the full committee or any of its subcommittees which was not attended by authorized government representatives.

"The record of the MEEC and its member companies in supplying oil to Europe under the direction of the U. S. Government is one which every American can and should view with pride—

PIPELINES are NOT SIDELINES with...
WILLIAMS BROTHERS
ENGINEERS & CONSTRUCTORS
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CABLE ADDRESS: WILLBROS.
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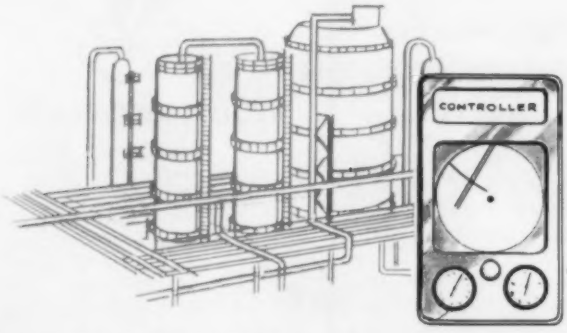
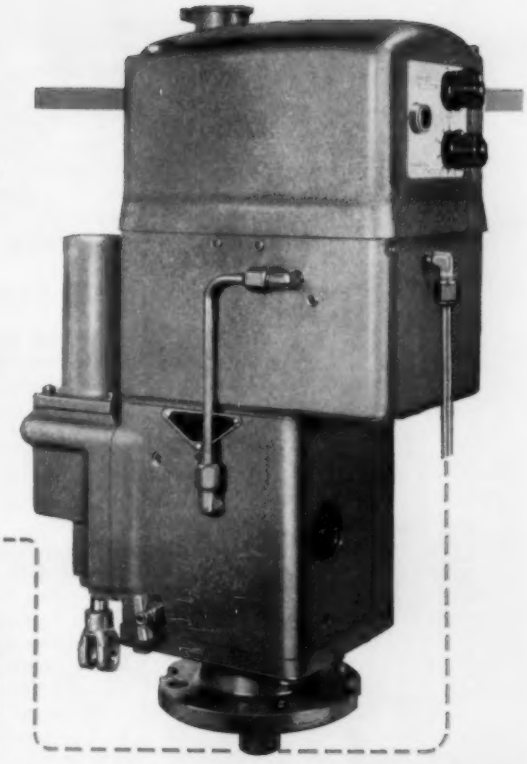
WOODWARD®
PG-PL GOVERNOR

with New Precision Pneumatic or Electric Speed Setting





This new Woodward PG-PL Governor for engines or turbines offers an ultra-precise automatic speed setting which responds to minute control-air pressure changes. It is also available for use with electronic controllers. The Woodward PG-PL Governor is adaptable to any engine or turbine and is standard on most makes.

TYPICAL INSTALLATIONS

1. Liquid or gas pipeline pumping station control.
2. Catalytic cracking plants for control of charge-pumps, air and gas compressors.
3. Maintenance of constant water level by control of boiler feed-water pump speed.
4. Forced and induced draft fans for boilers.
5. Blast Furnace blower control.
6. Process temperature control by varying speed of refrigeration compressor.
7. Process temperature control by varying speed of cooling water pump.
8. Pressure, Flow or Liquid Level Control in various plants.
9. Remote Manual Pneumatic Speed Setting to control one or more prime movers simultaneously as in marine propulsion, sugar mills, etc.
10. Remote Manual Speed Setting where electric means are prohibited.

CHARACTERISTICS

Accuracy of air speed-setting . . . .03% or better (responds to .001 p. s. i. change in control-air pressure in the usual 3 to 15 p. s. i. range).

Speed-Setting Pressure Ranges . . . 3 - 15; 3 - 9; 9 - 12; 5 - 25; or any reasonable range up to 80 p. s. i.

Adjustment . . . Speed vs. Pressure is set at factory with precision electronic equipment. Easily re-set in the field if desired.

Direction of Operation . . . Either high or low speed at maximum air pressure. Easily reversed in the field.

Speed Governor . . . standard, widely used and proven PG Governor.

WRITE FOR DETAILS — SEND COMPLETE DATA OF APPLICATION

WOODWARD GOVERNOR COMPANY

ROCKFORD, ILLINOIS

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not one for which American oil companies should be assaulted by politically inspired attacks merely for doing what their government asked them to do in time of emergency."

S. P. Coleman, vice president, Standard Oil Co. (N. J.), and chairman of the Middle East Emergency Committee, in a statement following publication of the O'Mahoney Senate subcommittee report on MEEC.

What MEEC might have been

"Neither the senator from Wyoming (O'Mahoney) nor the senator from Tennessee (Kefauver) approved of the oil price increase last January. Neither approves now of the administration's latest move to restrict oil imports through a voluntary cutback on the part of the majors rather than through direct controls.

"The two senators have now chosen an odd angle of attack. They have issued a blistering assault on last winter's oil lift to Europe, the brunt of it falling on the administration's decision to let the major oil companies handle this lift under government supervision . . .

"Granting, for argument's sake, that the Government might have assumed direct control, how would it have been done?

"First, we visualize an Emergency Petroleum Board set up in a few offices in the Department of Commerce . . . It could be immediately staffed by dollar-a-year executives from major oil companies, but Senators O'Mahoney and Kefauver would have none of that. This, they would point out, would constitute another ruse to circumvent the antitrust laws.

"Soon nonindustry officers would have to be rounded up and a staff for fact-finding purposes. In a short time the EPB would occupy an entire temporary building, then perhaps two. A thousand typewriters and various business machines would be collected, along with facts. How would they get the tankers? Requisition them for charter? From whom? By what explicit powers and at what rates? At this point several congressional watchdog groups would be detached to make sure the rates were not above the market level.

"As the weeks moved on, EPB would grapple with myriad problems of a fair price for the oil, insurance for the requisitioned ships, their cargoes and crews—necessarily underwritten by the Government—and so on. In all this, the supremacy of the antitrust laws would be observed to the letter. But how much oil would actually have been moved before the winter was long past?

"We think, too, that Senators O'Mahoney and Kefauver know the answer as well as anybody else, for Europe's

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Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less downtime, use world famous Miller Sand Pumps.

Write for descriptive price list.

SAND PUMP SIZES IN STOCK
O.D.—2½, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3419

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DU PONT *Petroleum Chemicals* NEWS

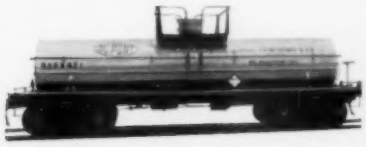
Number 79 in a Series of Bulletins for the Petroleum Industry

SEPTEMBER 1957

New survey reveals hidden buying motivations of service station customers

Refiners realize substantial savings by purchasing additives in quantity

If you are now buying your additives in drums, you can *save well over a thousand dollars each time you order* a Du Pont additive by the tank car.



With Du Pont Fuel Oil Additive No. 2, for example, a Mid-Continent refiner can save 8.4% on a carload by simply taking delivery in a 4000-gallon tank car instead of an equal quantity in partial car drum shipments. With Du Pont Antioxidant No. 22, the savings range as high as 8.9%.

These figures are, of course, based on freight rates between specific points, and the savings vary according to the shipping distances.

How much can YOU save?

To answer that question for you, one of our representatives will be glad to call at your refinery and study applicable freight rates and inventory patterns. He will then determine the most convenient handling method for you, and figure the exact saving you can make.

Still another in a series of Du Pont-sponsored surveys has recently been completed by National Analysts, Inc. The findings will soon be available in booklet form.

The objective of the survey was to determine what emotional reactions influence motorists to choose a service station, a brand of gasoline, or a TBA product.

THE NEW DU PONT MOTIVATION SURVEY REPORT has been packaged as a convenient flannelboard presentation. Roberts W. Brokaw, of Petroleum Chemicals Sales Promotion, demonstrates here how the results can be presented at meetings in easy-to-understand form.

Psychological needs

The psychologists in conducting the study determined that there are four basic needs which can be fulfilled through purchase of service station products and services:

1. **Play**—use of car for recreation

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

OVER

DU PONT *Petroleum Chemicals* NEWS

CONTINUED

New Survey

2. **Aggression**—desire for speed and fast acceleration
3. **Conservance**—need to preserve car as an investment
4. **Infavoidance**—the desire to avoid the *appearance* of inferiority

Specific products

Gasoline sales, as you might suspect, are most influenced by the play and aggression needs. This finding indicates that gasoline advertising should appeal to motorists' desire for recreation and powerful car performance.

It was found that motor oil and grease satisfy the conservance need. The promotion of these products should be directed accordingly. Body polish, which might be thought to satisfy the conservance need, actually gratifies more often the need for infavoidance. So do white sidewall tires.

Anxiety influences

Two of the areas explored were anxieties about product quality and service.

Apparently women drivers are more concerned than men about tire quality and repair. This may be because a flat tire is a greater inconvenience to women.

Women appear to have also a more generalized anxiety over automotive products they buy. This is possibly due to their having, in general, less mechanical knowledge than men.

Perceptions of service stations

Motivational needs lead to motorists' perception of different service stations as places to do business. Perception is influenced also by the opinions of others, including families, and by advertising and promotion of the dealer or the company he represents.

A summary of the findings of the survey are being published in book form for easy reference.

AUTOMOTIVE SERVICE OFFERED

I. T. (TED) ROSENLUND (right) says that actual under-the-hood technical service work on refiners' automotive problems is his greatest source of new ideas. And many of his ideas have resulted in unique demonstration equipment which enables refiners and marketers to prove their product quality to dealers and customers.

He is responsible for the design and construction of practical demonstration equipment for the Petroleum Chemicals Division. This equipment must make somewhat intangible fuel and lubricant properties come to life in the form of noise or motion. With it petroleum refiners and marketers can show their dealers and customers the quality built into their products.

Wide experience

Ted's long experience in automotive service work also enables him to assist in resolving particularly difficult problems as they arise.

Ted joined the DuPont Company in 1947 as manager of the Petroleum Chemicals Division's road test laboratory. Between 1942 and 1947, he had been fuel and lubrication engineer for the Allison Division of General Motors and a project engineer on combustion chamber design and development at the Packard Motor Car Company's jet engine division. Prior to 1942, he spent several years with a major oil company as research engineer on aircraft engine oil development.

Ted graduated from the University of Michigan with a BS degree in aeronautical engineering, majoring in engine design. He is a member of the Society of Automotive Engineers.

Expanded additives warehouse to serve Pacific Northwest area

The DuPont Petroleum Chemicals Division recently expanded its additives warehouse near Seattle.

Ideally located to serve the fast-growing refinery industry in the Pacific Northwest, it will continuously house an ample supply of all DuPont petroleum additives (except tetraethyl lead). The complete DuPont line includes Fuel Oil Additive No. 2, DuPont Metal Deactivator, dyes, antioxidants, and grease additives.

For fast deliveries

Arrangements with a local truck line plus the permanent warehouse staff will help considerably to expedite deliveries of DuPont additives to refiners.

DuPont TEL is supplied to refiners in this area from a DuPont "warehouse on wheels" at Ferndale, Washington.

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OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-5066

Printed in U. S. A.

needs last winter were immediate and urgent."

Editorial in the Journal of Commerce.

CALENDAR

SEPTEMBER

19-21 Rocky Mountain Oil Show, fairgrounds, Casper, Wyo.

20 Southern Gas Association, dispatchers' round-table conference, Baker Hotel, Dallas.

20 Southern Gas Association, compressor station round-table conference, Baker Hotel, Dallas.

22-25 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Mayo Hotel, Tulsa.

23-24 University of Oklahoma, School of Petroleum Engineering conference on fluid flow through porous media, Norman, Okla.

23-25 American Society of Mechanical Engineers, fall meeting, Statler Hotel, Hartford, Conn.

25 Natural Gasoline Association of America, regional meeting, Northern Hotel, Billings, Mont.

26-27 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

26-27 Mid-Continent Oil and Gas Association, Louisiana - Arkansas division, Roosevelt Hotel, New Orleans.

30-Oct. 2 American Oil Chemists' Society, 1957 fall meeting, Netherland Plaza Hotel, Cincinnati.

OCTOBER

1-2 Texas Mid-Continent Oil and Gas Association, thirty-eighth annual meeting, Texas Hotel, Fort Worth.

1-4 National Association of Corrosion Engineers, north-central region, Sherman Hotel, Chicago.

1-4 National Association of Corrosion Engineers, south-central region, municipal auditorium, Oklahoma City.

2-4 Golden Trend Oil Show, Pauls Valley Okla.

6-9 Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, fall meeting, Adolphus, Baker, and Statler Hilton Hotels, Dallas.

7-9 National Electronics Conference, thirteenth annual meeting, Hotel Sherman, Chicago.

7-9 American Gas Association, annual convention, Kiel Auditorium, St. Louis.

7-11 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

10-11 California Natural Gasoline Association, thirty-second annual fall meeting, Huntington-Sheraton Hotel, Pasadena.

10-12 American Society of Mechanical Engineers, American Institute of Mining, Metallurgical & Petroleum Engineers, fuels conference, Chateau Frontenac, Quebec.

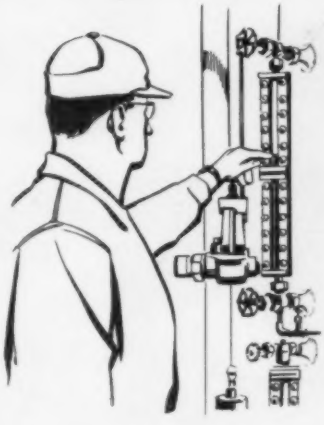
10-13 Louisiana Gulf Coast Oil Exposition, Lafayette, La.

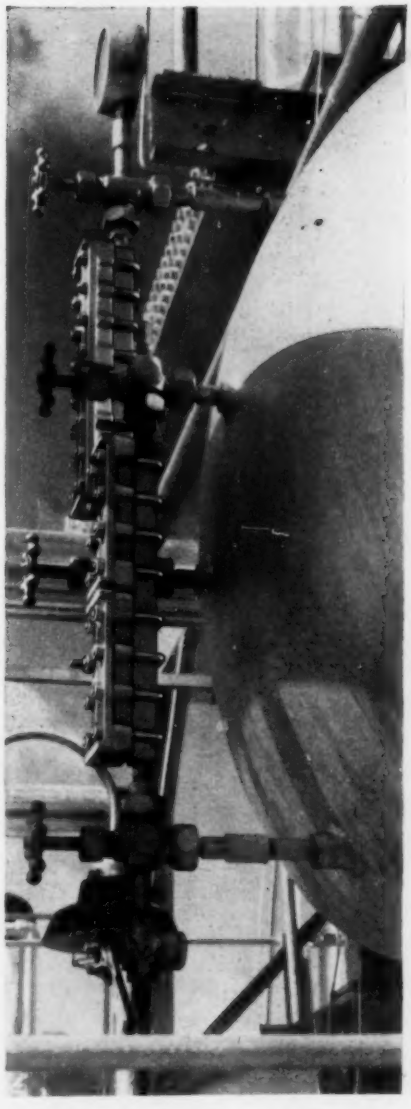
13-15 American Association of Oilwell Drilling Contractors, seventeenth annual meeting, Mayo Hotel, Tulsa.

13-19 OIL PROGRESS WEEK.

15-16 Gas Measurement Institute, sponsored by the University of Kansas, American Legion Hall, Liberal, Kans.

It's easy to see why... Penberthy gages are preferred





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To be sure of clear, accurate liquid level readings... at temperatures from sub-zero to over 1000° F. and to pressures exceeding 10,000 psi... simply specify Penberthy Gage Sets.

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by the world. Yet his eyes are always on the next horizon...
and even more advantages for his children. Natural gas
and oil help make this better world. In our own company alone
expanding activities steadily create new products,
new services, new jobs. New opportunities for the full life.
Gas and oil are good providers, too.

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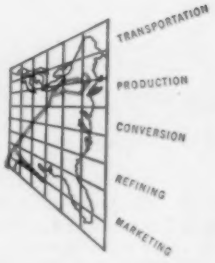

16-17 South Dakota Independent Oil Men's Association, convention, Alonzo Ward Hotel, Aberdeen, S. D.

17-18 Abilene, Tex., Geological Society; Society of Petroleum Engineers of American Institute of Mining, Metallurgical, and Petroleum Engineers, Abilene chapter; West Central Texas Oil and Gas Association; and McMurry College, second annual petroleum conference on new developments and applications in log interpretation techniques, McMurry College, Abilene, Tex.

17-18 American Institute of Mining, Metallurgical, and Petroleum Engineers, Southern California petroleum section, fall meeting, Biltmore Hotel, Los Angeles.

17-19 Four Corners Geological Society, second field conference, Gallup, N. M.

18 American Institute of Chemical Engineers, South Texas section, twelfth annual technical meeting, Moody Convention Center, Galveston, Tex.

20-22 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Peabody, Memphis.

23-25 National Association of Corrosion Engineers, western region, seventh annual conference, U S. Grant Hotel, San Diego, Calif.

23-25 National Association of Corrosion Engineers, seventh biennial Permian basin corrosion tour, Lincoln Hotel, Odessa, Tex.

24-25 Rocky Mountain Oil and Gas Association, midyear meeting, Northern Hotel, Billings, Mont.

24-25 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

25 Natural Gasoline Association of America, southern regional meeting, Washington-Youree and Captain Shreve Hotels, Shreveport.

25-26 West Texas Geological Society, fall field trip, Glass Mountains area, Holland Hotel, Alpine, Tex.

25-26 Abilene, Tex., Geological Society, Fort Worth Geological Society, joint field trip, San Saba County, Texas.

27-29 Independent Petroleum Association of America, annual membership meeting, Statler Hilton Hotel, Dallas.

28-30 National Lubricating Grease Institute, twenty-fifth annual meeting, Edgewater Beach Hotel, Chicago.

31-Nov. 1 American Association of Petroleum Geologists, Mid-Continent regional meeting, Education Building, Fairgrounds, Tulsa.

NOVEMBER

3-8 Society for Nondestructive Testing, second international conference, Hotel Morrison, Chicago.

6-8 Gulf Coast Association of Geological Societies, seventh annual convention, Roosevelt Hotel, New Orleans.

6-8 Society of Automotive Engineers, national fuels and lubricants meeting, Hotel Statler, Cleveland.

11-14 Society of Exploration Geophysicists, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

11-14 American Petroleum Institute, thirty-seventh annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

12-14 National Association of Corrosion Engineers, northwest region fall meeting, Penn-Sheraton Hotel, Pittsburgh.

22 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

Now Faster Service

on Delta's

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GOLDEN CROWN

NON-STOP between

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Faster service now from all mid-America and the Far West. Dovetail connections at New Orleans from all points—including through-plane service from the West Coast via Delta and American. From Chicago, Delta flies the only through plane DC-7 service to Caracas, *The Royal Caribe*. Now there are *two* non-stops daily from New Orleans to Havana: Super Convairs every morning at 9:40—*Royal Caribe* DC-7's each evening at 9:50. Delta keeps pace with booming Havana and Caracas.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

New Tool for Pipeliners

NOW you may wonder what the little red wagon pictured here has to do with the oil business. We wondered, too, when we first saw it. Well, it isn't just stuck in to dress up the page or a trick to catch a busy reader's attention. It does have a part in this great industry of ours, in pipelining, to be specific. And that's what we're concerned with in this issue.

For 60 pages in the Big Yellow Book's Annual Pipeline Number, assorted experts talk about all aspects of transporting crude, products, natural gas, and even that asphaltite called Gilsonite which they're now pipelining in a slurry. Starting on page 123, you'll find a wide variety of subjects covered.

When the Journal's pipeline editors were clambering over Kentucky's choppy limestone hills, we were impressed by the speed of the spread which is written up on pages 124-127, in spite of the terrain. One of the secrets to this seemingly effortless progress was plenty of equipment, about $2 million worth of it to build 65 miles of 30-in. loops. This spread had more than the usual quota of big sideboom tractors and draglines and the other lumbering construction monsters that move mountains and handle 2-ton joints of steel pipe.

We thought we had seen everything in the way of construction equipment when we came upon a road-crossing gang. One of them was pulling a Radio Rancher model little red wagon loaded with rock and dirt. Being alert reporters, we knew right away that something unusual was going on there.

The mystery was cleared up by Blondie Olrich, who ran this H. C. Price Co. spread. We were right about there being a story, and Blondie related it to us, with a chuckle and some pride. One of the special headaches on this job, we learned, was road crossings. Since the rocky soil generally ruled out machine boring, most crossings had to be tunneled by hand. Removing the spoil was a real nuisance, especially after the tunnel got to be 15 or 20 ft. long. Nothing they tried worked very well. Then someone was inspired to get the Radio Rancher and tie a rope on the handle for pulling in and out of the tunnel. Now, no crossing gang on the spread would be without one. There was some eyebrow lifting in the business office, however, when a dozen little red wagons showed up on Blondie's requisition.

The ingenuity of pipeliners which has been discussed here is not confined to the construction branch of the industry. It shines through all 20 articles of the special section which covers the whole field of pipelining. We think you'll agree there's something here for everybody.

Gene T. Kinney.

VALVE CLOSED TO PREVENT OVERFILL
VALVE OPEN TO RELIEVE PRESSURE BY FILLING CASING
BAKER DIFFERENTIAL FILL-UP COLLAR
PRODUCT NO. 1091 M&F

automation underground

THE VARIABLE VALVE in Baker Differential FILL-UP Equipment is an amazing example of "down-hole" AUTOMATION. As a string of casing is lowered in the well, this valve AUTOMATICALLY takes into account the *weight and viscosity of the mud;* the *rate of lowering;* the *hydrostatic head* in the casing and in the annulus; and the *pressures* which tend to build up ahead of the descending, piston-like string of casing. Then, having *instantly* computed ALL these factors, the Variable Valve opens just enough to prevent pressure-surge build-up by permitting the casing to fill AUTOMATICALLY from the bottom up while it is being lowered. As the rate of lowering slows down (preparatory to adding another joint of casing) the pressure drops and the Variable Valve closes, thus maintaining the desired fill without overfill or overflow.

This AUTOMATION cycle is repeated each time a joint of casing is added and the string is lowered. There is no build-up of dangerous pressures which might cause lost circulation by breaking down weak formations—no mudded-off production zones—no stuck casing resulting from "no-motion" time while surface filling.

In addition, there is a definite saving in time—often as much as one-third—by eliminating messy, dangerous surface filling of casing.

For cementing (or for floating if desired) a Flapper-Type Back-Pressure Valve can be made operative *at any time* by merely applying pressure inside the casing.

Ask any Baker representative or office for Catalog Supplement #301, or arrange for Baker DIFFERENTIAL FILL-UP Equipment at your supply store.—**BAKER OIL TOOLS, INC.,** Houston, Los Angeles, New York.

BAKER
DIFFERENTIAL
FILL-UP
EQUIPMENT

Does uniform pricing imply lack of competition?

THERE are investigators in Washington and elsewhere who contend that filling-station price signs afford all the evidence needed to convict the oil industry of price controls in violation of federal laws.

They proclaim that in the communities where they live, practically all oil marketing companies charge the same prices for the same grade gasolines. This, they say, is prima facie evidence that the sellers get together, forget about competition, and all agree to sell at the same prices.

Even some economists have been going off the deep end with supposedly profound discussions of the significance of "administered prices" and the like. They insinuate that all is not well legally in today's complicated economy as regards pricing, including oil.

Let's take a brief look at the facts about consumer prices for the oil industry's principal product—gasoline.

The price buyer can usually shade gasoline quotations a cent or more per gallon at cut-rate stations. He will sacrifice convenience and service and perhaps a few octanes, but if that is what he wants he can get it.

Motor fuels today have to meet certain minimum specifications. There is no way that the oil industry, even if it wanted to, can manufacture an inferior gasoline and put it on the bargain counter.

Furthermore there is nothing unusual in the uniform pricing of products of similar quality. The bargains of department stores and supermarkets to which the oil pricing critics point, are confined to "leaders" with the sellers hoping to make up in increased sales of regularly priced products what they lose in cut-price sales.

Obviously petroleum marketing cannot be carried on in this manner.

But does this mean there is no real competition in the sale of gasoline? Certainly not.

Regardless of retail price levels or how a complete oil operation is carried on there is competition in every step.

Production competition includes all methods of searching for new oil, and recovery methods after oil is found. Transporters strive for lower costs in every type of shipment involving petroleum products.

The advantage of one plant operation over another, if any, is a few cents per barrel yet refiners seek that saving and will spend a billion dollars this year in new facilities for that competitive purpose.

In retail selling by aggressive methods, large companies, independent jobbers, and dealers endeavor to increase their gallonage and profit over those of a competitor down the street selling at the same price.

Thus, as a logical merchandising procedure the oil industry has comparable prices for comparable products within comparable areas. The practice does not nullify in any way the basic competitive operations of the oil business or its general price responses to changes in supply and demand.

THE WELDER'S

Republic

THE TWO FRIENDS—SHIELD AND PIPE—are vital in the installation of a good pipe line. The importance of the welder's shield is obvious. So is the need for uniformly thick walls for speed welding without costly delays. You get this—and more—with Republic Electric Resistance Weld Line Pipe.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

BEST FRIEND!

Electric Weld Line Pipe

Just as welders *know* they can rely on the dependability of their protective head shield, so it is with the dependability of Republic Electric Resistance Weld Line Pipe.

They know that every joint is uniformly concentric, permitting accurate line-up for immediate welding. They know that walls are uniformly thick with no thin spots to worry about—that every joint can be welded at top speed without the danger of costly burn-throughs.

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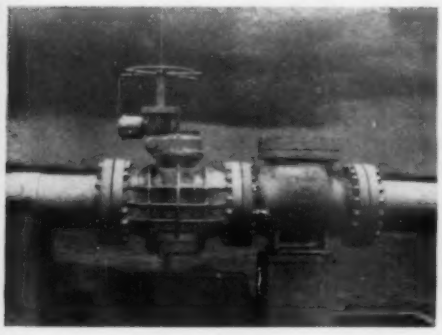

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the OIL AND GAS JOURNAL

September 16, 1957

FIRST TEST of imports plan finds Indiana Standard's John Swearingen talking to panelists Lott, Dwyer, Carson, and Fowler.

Panel Hears Objections to Import Plan

WASHINGTON. — Will the demand by a half dozen companies for increased quotas wreck the imports-control program?

That is the big problem now facing Capt. M. V. Carson, Jr., administrator of the program. Carson currently is heading a special panel hearing arguments of the companies for relief.

The relief asked by the few protesting companies totals well over 55,000 bbl. daily. But observers here believe their hardship claims were foreseen by the cabinet committee in writing the program.

Carson reportedly has an oil "fund" from which he can grant relief in these cases. Size of the reserve has not been disclosed. It is reported, however, as anywhere up to 75,000 or 100,000 bbl. daily.

As long as Carson can stay within the bounds of this fund in settling inequities that arise, the program likely will be effective. His big headache: Be sure the hardship claims are factual and won't open the gate for increased quotas to everyone.

Three companies challenged the adequacy of their quotas last week.

They were Tidewater Oil Co., Standard Oil Co. (Ind.), and Standard Oil Co. (Ohio).

Three more will appear this week.

Sitting with Carson on the panel deciding the cases are: Ralph N. Fowler, chairman of the Middle East Emergency Committee, who now is serving as a consultant to the Office of Defense Mobilization; Robert P. Dwyer, assistant solicitor of the Interior Department, and Frederick Lott, assistant director of the Office of Oil and Gas.

Decisions likely won't be reached for 3 weeks from hearing date.

The arguments . . . Each of the companies heard last week had a different story.

Tidewater, asking for an increase of 27,800 bbl., claims the 34,200 bbl. allowed it will result in "economic confiscation" of its $200 million Delaware City refinery.

Standard of Indiana, seeking 23,700 bbl. more, charges its 29,800-bbl.-daily quota discriminates against it in favor of competitors.

Ohio Standard took the position that the cabinet committee should have considered 1958 import programs before setting quotas running through the first half of the year.

Tidewater and Indiana Standard differed on one question: Whether quotas should be based on marketing areas rather than on Districts 1-4 as a whole.

Tidewater, doing business in limited areas, held that marketing areas should be the base used. Indiana Standard wanted everything east of the Rocky Mountains lumped together. Ohio Standard, also marketing in a limited area, supported Tidewater.

The Tidewater Case

D. T. Staples, president, presented Tidewater's case, which offers the biggest test of the import program. He charged flatly the Tidewater quota amounts to "economic confiscation."

He gave this explanation of how the company was stuck with a low and unfair quota: Tidewater closed its Bayonne refinery in 1954 and did not get its new Delaware plant running until this year. As a result, it had imports of only 13,200 bbl. daily over the 1954-56 test period.

Tidewater got the maximum 12,000 bbl. daily increase over 1956 allowed

new importers. But its 34,200-bbl. quota is much less than it would have received had it been refining and 50,400 bbl. less than the 84,600 bbl. daily it had hoped to be importing now.

Staples explained that Tidewater borrowed $200 million to build the new refinery. It spent $35 million on equipment to process low-gravity, high-sulfur crude. This equipment cannot be used if domestic oil is refined.

In addition, Tidewater contracted for some 250,000 tons of tankers at high rates for periods as long as 12 years. It also committed itself to charter 17 tankers to be built by a subsidiary by 1961.

Tidewater also is committed to take substantial volumes of foreign crude from reserves of its parent company, Getty Oil Co., and others, and has some production of its own through participation in the Iranian consortium.

Faith broken . . . Staples, in effect, charged the Government with lack of good faith in cutting Tidewater's quota so thin.

The Delaware plant was built in response to the Government's plea for increased refinery capacity, he said. It was given a certificate of necessity and rapid tax amortization under that program. And the Government, he said, also encouraged American companies to develop foreign oil reserves.

Staples, under questioning by Carson, admitted that when it was decided in 1953 to build the new refinery the company knew that the question of import control was a live issue in Congress and government circles.

The company considered this, he said, but went ahead because "we didn't believe imports would be curtailed because United States reserves are very limited.

"We felt that as far as national security was concerned there should be no restriction of imports."

The company is still against import controls, Staples said. He indicated that if Tidewater's quota is not raised it may import residual fuel oil for the Delaware city refinery.

Too sharp a cut . . . Staples argued that the 60 per cent cut below Tidewater's committed import program was too severe.

The average reduction for established importers was only 22 per cent.

He said it meant Tidewater could process only about 29 per cent foreign crude. Others could use about 54 per cent. The company would be denied access to the type of crudes for which its refinery was built.

"The revised quota requested by Tidewater would place the company in the position of being able to process at least the same percentage of foreign crude oil as the average competitive refinery on the East Coast," Staples said.

"This request gives no consideration to the advantages gained by its competitors as the result of their importation of residual fuel oil made from foreign crude processed outside the United States."

Indiana Standard

John E. Swearingen, executive vice president of Indiana Standard, spearheaded his company's attack on the program. He called it arbitrary and inequitable.

Swearingen assured Carson, however, that regardless of the outcome of his plea to increase his quota from 29,800 to 53,500 bbl. daily, the company will cooperate through the first year of the program.

The import program is unsound for a number of reasons, Swearingen charged:

. . . The 9.6 per cent ratio of imports to domestic demand called for by the cabinet committee has not been proved the peril point. It might be 9.8 per cent, 10.1, or some other figure.

. . . The historical basis on which quotas were set is unfair to some companies, over-generous to others.

. . . The quota given Indiana Standard places in jeopardy investments of over $100 million in the Caribbean and Venezuela to get crude for its own use and $45 million put in the new Yorktown refinery.

. . . The company is allowed to import only 4.5 per cent of its crude needs in Districts 1-4. "Established" importing competitors as a group are given 15 per cent and all importers are allowed 13.7 per cent.

. . . It is the largest buyer of domestic crude among the importing group, taking 17 per cent of the total for the group, yet it is allowed only 4 per cent of imports.

. . . Domestic asphaltic crudes are unobtainable and the company is limited in imports. But competitors can refine abroad and import solid asphalt without restriction.

Two proposals . . . Swearingen offered two ideas, either of which, he said, would take care of the situation:

. . . Give all importers, present or future, 9.6 per cent of his refinery demand, if not more than planned, or the cabinet committee allowable, whichever is larger.

. . . Exempt asphaltic crudes from quotas, reducing the over-all quota by this 125,000 bbl. daily.

The across-the-board 9.6 per cent quota, even with the larger percentages given newcomers under the present system, would raise the total 35,000 bbl., not greatly out of line with the cabinet committee program, Swearingen said.

Projecting this idea through 1965, he said if all who want to import are allowed to do so imports in 1961 would be 10.6 per cent of domestic demand but by 1965 they would be down to 9.8 per cent.

Swearingen admitted that if asphaltic crudes are exempt without reducing the over-all allowable it would hit domestic producers. But he raised no objection to cutting the allowable from 756,000 to 630,000 bbl. daily.

Unfair penalty . . . Swearingen pointed out that his company has always gone along with the Government's efforts to reduce imports. Now, he said, it is being penalized for its cooperation.

"Unless adjustment of our quota is allowed, every voluntary restriction in imports that we have made in the past will prove to be an equivalent reduction in the amount we will be allowed to import in the future," he told Carson.

"Had we followed the course of some of our competitors and largely disregarded government requests, we would have benefitted then and now."

It will cost Indiana Standard an additional 70 cents per barrel before taxes to use domestic crude at Yorktown, Swearingen said. The total additional cost will be close to $3,000,000 per year after taxes.

Swearingen explained that crudes of the same gravity and about the same sulfur content carry posted prices of $2.84 per barrel in West Texas, $1.85 in Kuwait, and $2.65 in Venezuela. Transportation costs are 65.4 cents from West Texas and, with import duty, $1.076 from Kuwait and 29.9 cents from Venezuela.

Total delivered cost, therefore, is $3.494 for West Texas, $2.926 for Kuwait and $2.949 for Venezuela, or an advantage against West Texas of 57 cents for Middle East oil and 54 cents for Venezuela.

In addition, however, it is reported that discounts up to 25 cents per barrel have been granted in some instances on the foreign oil, Swearingen said.

Ohio Standard

Ohio Standard will go along with the program this year. But it will have to think about going along in 1958, Richard C. Sauer, vice president, told the panel.

The company has a quota of 8,200

bbl. daily. It is asking for 13,500 bbl. daily for the first half of 1958. This would give an over-all average of 10,850 bbl. a day for the full 12-month period.

Ohio Standard is bringing oil in from both Venezuela and the Middle East. It imports to the East Coast, where it makes exchanges for domestic crude at its inland plants, Sauer disclosed.

The difference between the prices of domestic and foreign crude delivered on the East Coast is about 50 cents a barrel, Sauer estimated. To make exchanges, however, Ohio Standard has to give up part of that saving, he said.

The company began to import 2 years ago, as products from foreign crude began to appear in its marketing area. It started out with 1,000 bbl. daily in 1955 and by the end of 1956 was up to 4,000 bbl. It planned to bring in 7,500 bbl. daily during the third quarter of this year and 9,000 in the last quarter. For next year it programed 12,000 bbl. for the first quarter and 15,000 for the second.

Imports move inland . . . Sauer explained that the flow of products derived from foreign crude into the Ohio area is expected to increase, particularly if the Laurel pipeline is built.

To remain competitive, he said, his company must import the same percentage of foreign crude as its competitors.

Asked by Carson whether he thought a general practice by inland refiners of importing crude to be exchanged on the East Coast was desirable, Sauer said "the Government should not be concerned."

"This offers an opportunity to get started in a small way in importation and in the course of time, when it is necessary or desirable, for substantial quantities to be imported," Sauer explained. "It will then be economic to move the oil to refinery by pipeline."

Ohio Standard, unlike the other two companies, refused to criticize the import program.

"Any program would be very difficult to devise which would satisfy everybody, and we all have personal reasons for approving one approach over another," Sauer said.

"In the long run we feel that imports are going to increase, that the crude is going to be run in different areas of the country and that in the course of not too many years it will be necessary and desirable to move foreign crude into Ohio and probably farther west for refining."

Eastern extension by Interprovincial brings . . .

More Alberta Oil for Toronto

EDMONTON.— Interprovincial Pipe Line Co. has started moving crude oil through its new 156-mile, 20-in. extension from Sarnia to Port Credit, Ont., near Toronto. This will permit Alberta producers to gain a larger share of the growing Toronto area refinery market which is also served by foreign crude.

First oil has been delivered to the British American Oil Co., Ltd., refinery at Clarkson, Ont. Deliveries to Regent Refining (Canada), Ltd., at Port Credit are scheduled to start November 1. British American is increasing crude capacity from 21,500 to 61,500 bbl. per day; Regent from 14,000 to 34,000; and Cities Service Co. is building a new 20,000-bbl. refinery, all during 1957.

Capacity of the extension with one station at Sarnia is 111,000 bbl. per day. A second pump station, to be built when demand warrants, will raise capacity to 186,000 bbl. per day.

Toronto area plants have been supplied by lake tanker from the Interprovincial terminal at Superior, and by river tanker from the Portland-Montreal pipeline bringing in Trinidad, Venezuela, and Colombia crude.

Expansion program . . . The Port Credit extension is part of a $26-million expansion this year which includes two looping schedules. One is near Glenavon, Sask., and the other between Clearbrook, Minn., and Superior, Wis., on the Lakehead Pipe Line Co., Inc., section of the system.

A 3,800-hp. electric pumping station was completed last week at Sarnia. One of three 120,000-bbl. floating-roof tanks has been finished and work is proceeding on the other two. Interprovincial built its first automatically controlled electric station at Indian River, Mich., to go into service at the same time oil is pumped to Toronto.

Stations at Regina, Sask., and Glenboro, Man., are being expanded, and temporary diesel boosters are being installed at Edmonton and Hardisty, in Alberta, and Kerrobert and Loreburn in Saskatchewan.

The expansion will make possible the continued increase in deliveries through the 1,931-mile system, originating at Edmonton.

Test Set for Prison Farm

HOUSTON.—Exploration will begin within 90 days on Houston's 300-acre prison farm.

Trice Production Co., only bidder in a city lease auction, paid a bonus of $8,275 for exploration rights on the tract. The city retained 25 per cent royalty.

Several gas and distillate wells have been completed near the prison farm in recent months. The acreage is near the south edge of Houston. Trice Production has completed 11 oil wells on the city-owned Holmes Road garbage dump.

DO's

- . . . Treat a reporter as your equal.
- . . . Be prepared with facts.
- . . . Give straight answers.
- . . . Say, "I don't know," if that's the case.
- . . . Keep all promises.
- . . . Be sure reporter gets the facts straight.
- . . . Be sure he understands clearly when you're talking off the record.
- . . . Be patient.

DON'Ts

- . . . Be hard to approach.
- . . . Be mysterious when approached.
- . . . Talk on an important matter and then expect reporter not to print story.
- . . . Overuse the phrase: "Don't quote me."
- . . . Try to write or edit the story.
- . . . Burden the reporter with your past sad experiences with newsmen.
- . . . Lose your good manners.

What to Do When a Reporter Calls

W. A. Bachman
Tulsa District Editor

WHEN A NEWS REPORTER comes calling, remember one thing: He's another guy just like yourself—making a living. You deal in oil. He deals in news.

Chances are this reporter in your office will write a dozen stories a day, hundreds a month. His time for your story, and his interest in it, are limited.

He is not out to get "you" but to get a story.

If you can see the reporter in this light—as an ordinary guy like yourself, doing a job—half your troubles are over. Treat him as an equal, give him a break—and, if he's like 99 per cent of his brethren, he'll do the same for you.

The newsman comes to you because you supposedly have the answers to a certain situation.

If you know the facts, answer his questions straight and undiluted. If the reporter's questions indicate he's unfamiliar with the full story and all its background, be sure to set him straight.

The way you or your company are pictured for the public in the story may depend on how well you enlighten the reporter.

Here's another tip: It's better to give a straightforward answer also to the unpleasant questions.

Maybe the cold facts do put your company in an unfair light. There's always a good explanation. Give it. Perhaps the facts represent an unusual situation—they're out of date and things are now different—or the company is taking action to change them. Never let an unfavorable set of facts go unexplained or unchallenged.

Talking Off the Record

Maybe you know the answers but for some reason can't make them known to the public.

In this event, two courses are open:

. . . Don't talk.

. . . Talk off the record.

If the matter is really confidential, the safest procedure is not to talk. But this should be a thoroughly understood policy blanketing everyone in the company involved in the matter. If you refuse to reveal the facts to one reporter but another member of the company does talk to another reporter, both you and the company are put in the position of double dealing or playing favorites.

The best way to handle such a situation is to tell the reporter why you can't discuss the matter at the moment. For example, say it's a new process for making a new product which isn't ready to be revealed. Perhaps patent arrangements haven't been completed. Maybe the idea behind the development is good but further tests are needed. Or it might be that the company hasn't finally decided what to do. In any event, to explain why you can't discuss the process or product with the reporter will contribute to friendlier relations.

This refusal should be accompanied by a promise to reveal the facts when the silence can be lifted. If you know the exact date, make arrangements with the reporter for a conference then. If the date is uncertain, make a note to call the reporter when you can talk. But be sure of one thing: If you do make a promise, deliver. It's far better not to promise anything if you're really not in a position ever to talk.

You may decide to talk off the record. But the understanding should be definite between you and the reporter on:

. . . Just what is off the record and what is publishable.

. . . When, if ever, the material can go on the record.

The excuse for giving information off the record is this: You want to give the reporter background material for an approaching development to increase his understanding of what's happening. Or you want to give him the full details at your leisure with the understanding he will withhold them until they can be released.

The device is often used and often abused. The abuse arises from misunderstanding on just what is off the record. It's easy for a news source to say, "Now this is off the record" and forget to say when he's back on the record. The reporter is likely to assume that less is off the record than his news source intended. Or if the newsman assumes more is off the record than intended, he is put at an unfair disadvantage with his news competitors.

You don't know . . . The time may arise when a reporter will ask a question you can't answer.

The best course is to admit you don't know the full answer rather than to lie about it. It's good public relations to try to find the answer. Or you

The chasm between the general public and industry is probably greater for oil men than any other. Oil is mysterious. It is a complex industry. Its language is unintelligible to the average citizen. Its officials are clannish, technical men, well removed from its customers.

Yet public understanding is vital to oil's future. And the most effective bridge over the chasm of ignorance is the press. The key member of the press is the reporter. If he knows what you're doing, if he understands your problems, so will the public.

Here are some ground rules you might follow the next time a reporter calls on you. These were written by an experienced newsman who knows how a reporter thinks, what he wants, and how he will react.

may refer the newsman to some expert who should know. If none is available, let the case rest there.

No use bluffing through. No one is expected to know all the answers to everything these days—even in a person's own field of work. The person who tries to pose as a fountain of knowledge is on dangerous ground.

A Few Don'ts

It's easy to maintain good relations with news media if a few cautions are observed. For instance:

. . . Don't tell a newsman what he can or can't print. They don't tell you how to run the oil business. Telling a newsman he can't print something is a challenge. He has to get the story then or admit he's a second rater. So if a reporter already has the unfriendly facts and you can't persuade him to delay the story, your best course is to explain them to your advantage. But if he doesn't have the facts and you're his source, naturally you're in a better position.

But never tell the newsman he can't print the story. Better to say you're not in a position to discuss it, perhaps say why, and let it go at that.

. . . Don't tell a newsman something hot and then expect him not to print it. Make arrangements for confidential talks or off-the-record sessions before you talk—not after.

. . . Don't play the ostrich. Too many oil men like to cloak their operations in mystery. They won't explain some action which calls for explanation if their operations are to be understood in the industry and by the public. This secrecy often leads to misinformation, misunderstanding, and the impression the oil man has something to hide. This also makes oil suspect when its leaders come to the public for support of a program.

. . . Don't be afraid of the press. Some few oil operators have an aversion to seeing their company name in print. The trouble is if a company shies away from legitimate news stories, then chances are it will be written about only when the news is bad.

. . . Don't overuse the phrase: "Don't quote me." . . . It may put you in a position of being unwilling to stand behind what you say.

There's a proper time for this, of course. The times are when you know the facts of a situation but aren't involved and don't want to become involved; or when you know only part of the facts on a controversial matter and fear use of your name will associate you with the full incident.

. . . Don't try to control the press media by limiting reporters to a press handout. It's better to welcome further questions and have someone available to answer them. No press release will cover all the questions various newsmen will want.

. . . Don't be an editor by insisting on seeing a reporter's story before it is published. Perhaps if the subject is technical, the reporter will ask that his story be read and corrected. Or if a writer is doing a feature story on a personality or company policy, advance arrangements for some authority to check the story are in order. Normally, the reporter is affronted if he is requested to submit a news story for company editing.

. . . Don't be resentful if all the facts given a reporter are not used. The writer is limited by space and the judgment of his superiors. What you think is important may not seem so to the editor. The facts you gave may be only part of a wider story. If your position has been presented fairly and in proper relation to the whole case, you should have no complaints.

. . . Don't squelch a reporter. If he has made a mistake in the story, call it to his attention quickly. If the error is serious enough, usually he will make arrangements to correct the mistake. Even so he wants to be informed to avoid making the same mistake again. It's poor policy to complain to the reporter's superiors. The reason for this is obvious. If you think you've been libeled, however, that's a legal matter, best left to your lawyer.

And a Few Do's

Any primer on how to meet the press must include these positive actions:

. . . Be prepared for the reporter if you have adequate time. Logical questions can be anticipated usually and answers got in mind. Facts and figures should be handy for use if needed. If this is not possible, it's a good idea to have some experts handy who have the answers at their finger tips.

. . . Tell the truth or say nothing. Propaganda is dangerous. Misrepresentation is a serious mistake. And a lie is fatal. It nearly always will catch up with you, and thereafter you're dead as a spokesman for your company.

. . . Show good manners. Newsmen always get an ear full of this: "I wish you guys would get your facts straight." "I'm always being misquoted by the press." "That other so-and-so publication never spells my name correctly." "I can't talk to you. The last time I saw a reporter, he didn't get a thing right." Every case was an individual incident. It should have been taken up with the reporter involved and not with the press in general.

. . . Be patient—not superior. If the reporter has only a meager knowledge of the subject and you're a technical

expert on it, the best policy is this: Explain the processes involved in the simplest terms. Compare them with ideas or processes with which the reporter is familiar.

. . . Honor a reporter's resourcefulness. If he questions you first on details of a development and indicates he fully knows what's coming up, it's bad policy to call in other reporters and give them the story first or at the same time. If a general announcement is needed, however, it's good taste to be sure that the release is timed so that the reporter who asked first is among the first to be able to publish the news.

The Press Conference

Chances are you won't often have to conduct a full-blown press conference. Such arrangements usually are handled by public-relations officers of a company. But just in case the occasion arises, it's good to know a few ground rules.

The press conference has been devised to make it easier for the greatest number of press representatives to be serviced at the same time on a single story. The conference may be initiated by a company to release a story in which it is interested or to meet widespread requests for information by reporters.

Normal procedure then is this: Set a time suitable to the greatest number of publications. Notify the news media telling them generally what's to take place. Start the conference on time. Have a prepared announcement giving full details on what's involved. Allow time for reporters to read the announcement and then throw the conference open to questions. If you are up to answering all the questions, well and good. But if you're not, have on hand the men who do know the answers. It's advisable also to have photographs prepared to illustrate the stories.

Some publications may not be able to send a reporter at the appointed time. You should mail or send them by messenger the announcement and photographs with information on whom to contact for any more details desired.

One word of caution: An ostentatious display of wealth should be avoided. If the session is billed as a press conference, it should be primarily that with food and refreshment kept to a minimum. If it is billed as a press conference and party, then you can be the judge of how much of a party you want to give. In any event, any appearance that you are trying to buy favor with the press should be shunned. The oil industry has been lampooned often by its critics on this score, and it's well to keep that pitfall in mind.

Public Relations: Your Job

If you're your own public-relations man, you should make press relations an integral part of your thinking.

There's nothing mysterious about it. Many men of only modest accomplishments have become virtual spokesmen for their industries with the press by a few simple rules. They cultivate reporters. They are always available to newsmen. They always give straight facts and have a broad view of the industry and their role in it. Their opinions become respected.

For instance:

When was the last time you called up a reporter on your newspaper and gave him a tip on a story outside the oil industry? Or inside the industry?

When have you called up the reporter and invited him out to lunch just to talk?

When have you dropped by to chat with the newspaper's editor and to discuss problems of the oil industry? Have you ever invited him to lunch with you and other oil men at the club?

It really doesn't take much time and effort to cultivate good press relations. It's now becoming a job for each individual oil man. It should be started now when genuine friendships can be established—not in desperation later when all the oil men can ask is favors.

Report on public opinion:

Three of four like you, BUT—

FOR EVERY PERSON in the U. S. who doesn't like the oil industry, there are three who do.

Opinion Research Corp. says that 75 per cent of the population has a good impression of the oil industry. But they have some reservations.

Twenty-three per cent say the companies make too much profit. Twenty-four per cent would like to see the state set the retail price of gasoline. And 62 per cent feel that the oil industry is controlled by a few big companies.

These results of a nationwide poll were reported to the National Petroleum Association last week in Atlantic City by Dilman M. K. Smith of Opinion Research. Here are some of the other results:

. . . Prices. About 75 per cent noticed that the price of gasoline is going up. They rated it right behind haircuts and hairdos, and ahead of meat, autos, and cigarettes.

. . . Taxes. A big 82 per cent of the people don't know how much gasoline tax they are paying. They have only a foggy idea about it.

. . . Competition. Only 7 per cent say the oil industry is the most competitive. In contrast, 67 per cent think the automobile industry is the most competitive.

However, 56 per cent think there is strong competition at the service-station level. In comparison, only 33 per cent feel that there's strong competition among the companies.

. . . Price wars. Half the people want an end to gasoline price wars, because the wars hurt the dealers. Very few of them feel price wars hurt the oil companies.

Public relations . . . The Korean war and the Suez crisis caused tremendous disruptions in the flow of oil. But so well managed is the oil industry that the customers scarcely felt the impact.

Smith used this to illustrate that good deeds are not enough. They must be interpreted continuously or many people think a good deed is a bad deed.

Benjamin F. Fairless, president of American Iron and Steel Institute, echoed Smith's thinking. The corporations which enjoy the best public acceptance are the ones that do the best job of keeping the people informed, he told the N.P.A.

But good communications techniques and spreading a lot of information around are never the whole story. There must be good things to tell the people, he said.

"No matter how many sweet-sounding words you heap over dung to cover it up, the American people have a way of detecting the original aroma," Fairless said.

"We live in an age of highly skilled communications. To the modern corporation, this means the goldfish bowl in which it lives has a clear, clean glass at all times."

He said the people expect corporation information, and they are ready to exercise their right to impose a correction on any policies they disapprove.

Texas Rules Cause Rift

● Inequity is charged by operators in big North Cowden pool, but operators can't agree on field-rule amendments

AUSTIN.—A showdown is nearing in the squabble over how to change field rules in the sprawling 28,000-acre North Cowden field in Ector County, West Texas.

Producers in the 700-well pool are scheduled to file closing recommendations with the Texas Railroad Commission September 16, although most of the operators have already gone on record during hearings which ended earlier this month.

Nearly all the operators agree that some changes in field rules are needed, but they can't get together on what the changes should be.

However, there's unanimous agreement on one point: Raise the present 22,000-bbl. MER. They argue that the depressed MER not only is causing loss of allowable to old wells but is also discouraging the drilling of new wells.

Pan American Petroleum Corp., which filed the first application with the commission for amendments to the field rules, says the present setup:

. . . Stalls gas injection. The field's cooperative injection program isn't expanding as it should because some operators with low gas-oil ratios have no incentive to inject.

. . . Endangers correlative rights by causing operators now injecting gas to lose oil to those who are not injecting gas.

. . . Imposes hardship on old wells. Under the static 22,000-bbl. MER, operators of old wells have to give up part of their allowable as new wells are drilled.

Pan American is asking the commission to change to a per well MER as new wells are added and older wells are reworked, and to increase allowable credit to gas-injecting operators for all gas injected, rather than for only that volume needed to remove ratio penalties.

Pan Am recommends no change in the field allocation formula based 50 per cent on acreage and 50 per cent on average unit potential, except that present allocation factors be frozen.

However, several other operators see the present allocation formula as one of the chief culprits.

Sun Oil Co., Mar-Tex Oil & Gas Co., Texas Crude Oil Co., and E. E. Fogelson want the formula based on acreage and on the well. Sun suggests 75 per cent acreage and 25 per cent well. Texas Crude and Fogelson are asking for a 50-50 formula, but wouldn't object to a 75-25 rule.

Sun also suggests a cut in permissive gas-oil ratio from 3,000:1 down to 2,000:1, and injection credit applied up to an 8,000:1 limit.

Gas program slowed . . . North Cowden is 27 years old this month, but it's still being developed around the edges. Since discovery in 1930 it has produced more than 117,000,000 bbl. of oil, reaching a maximum of 33,000 bbl. daily in 1946.

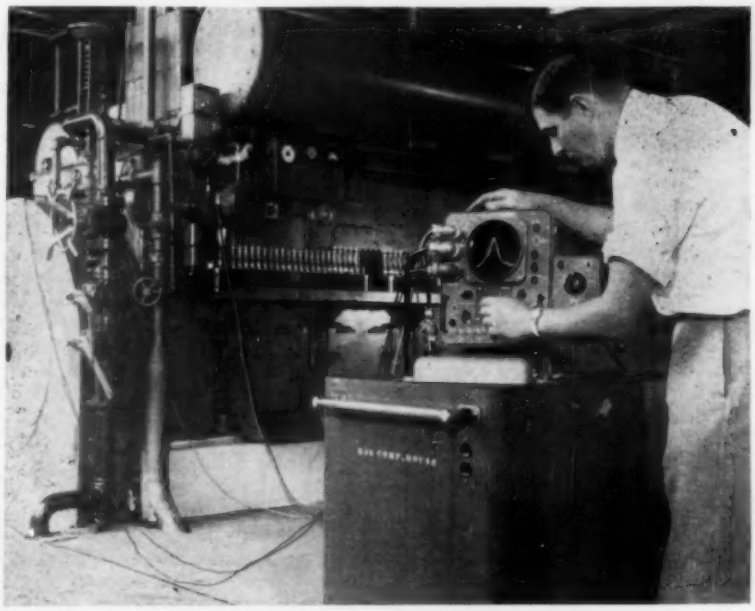
By June 1950, production had fallen off to 15,000 bbl. daily. The same year, the commission approved Pan Am's application for the cooperative gas-injection program.

There are now 63 wells injecting 20,000,000 cu. ft. of gas daily. This amounts to about 45 per cent of total gas production.

But efforts to expand the program have been unsuccessful due to lack of immediate incentive for an operator with low ratio wells. As a result, Pan Am says, injecting operators are losing oil to noninjectors.

Better recovery . . . Gas injection is better than initially expected, Kenneth J. Barr, senior petroleum engineer for Pan Am, told the commission. G.O.R. performance is good, and there has been no channeling. The program has cut back the pressure decline in the field from 12 psi. per million barrels of oil to 3 psi.

Pan Am estimates that primary operations could recover only 21 per cent of oil in place in the Grayburg pay. If the current gas-input rate is continued, recovery will be hiked to 26 per cent. But if all available gas were returned to the reservoir and all operators participate, recovery could be boosted to 29 per cent.



Small Package Analyzes Big Engines

A PORTABLE engine analyzer about the size of an overnight bag is doing a job usually required of three or more electronic instruments.

The pint-size trouble spotter, which weighs only 36 lb., quickly pinpoints malfunctions and potential malfunctions any place in the engine—and it does it without costly shutdowns. It is hooked up and put to work, while the engine continues to run, by merely connecting wires to five points on the engine.

Ignition, vibration, and pressure information is flashed to a small screen where it can be translated quickly by the operator, who can learn to use the machine in a few hours.

Sperry Gyroscope Co., the developer, is already in full production and plans deliveries by fall. An indication of the machine's potential: Sperry says an early model, using only ignition and vibration data, saved $4,800 a month for an industrial plant using 80 natural-gas engines.

New style platform takes its first dip . . . And workmen install conductor pipe, as . . .

Aluminum Offshore Rig Makes Debut

THE WORLD'S first aluminum drilling platform has been installed in Lake Maracaibo to combat corrosion in the lake's oxygen-rich waters.

Builders of the lightweight offshore structure say aluminum platforms have a big future in Maracaibo development for three reasons:

. . . **They eliminate** concrete piling.

. . . **They can** be installed speedily.

. . . **They can** be salvaged and moved to another location.

The first aluminum platform was installed for Superior Oil Co. by J. Ray McDermott & Co., New Orleans. Reynolds Metals Co. furnished the aluminum and worked with McDermott in fabricating the new-type structure.

Three other platforms also were being installed in the lake by McDermott, and others are being fabricated.

Reynolds engineers say the completed platforms are the largest all-welded aluminum structures ever built. They range from 111 ft. to 121 ft. in height, are designed to reach about 9 ft. above water level, and contain about 80,000 lb. of aluminum.

Up to now . . . The aluminum platform represents a revolutionary change in installations at Maracaibo. Virtually all of the 7,000 derricks at the lake have been mounted on concrete piles and require up to 25 days to install.

The piles, of course, cannot be moved when a drilling location is abandoned.

Because of corrosion only a relatively few steel drilling platforms have been used in the lake.

A combination of factors creates the corrosion problem at Maracaibo. Current from rivers emptying into the pear-shaped lake, connected with the Gulf of Venezuela, keep the salt content quite low. The river waters are rich in oxygen, which combines with other chemicals in the lake bottom to produce a highly corrosive effect on ferrous metals.

For several years tests have been made in the lake of the corrosion-resistant alloy now being used in the drilling platform. The same alloy has a long record of successful performance in sea water.

The new-type structure uses aluminum jackets to give the platform corrosive resistance, structural strength of steel, and lightness of weight.

Steel decking and steel piling are used, but all parts exposed to water are made of aluminum. Steel piles anchoring the platform are driven inside the four legs of the structure.

The center conductor guide, through which a steel conductor pipe is driven, is made of aluminum. Underwater lateral bracing also is aluminum.

Speedy and mobile . . . The first aluminum platform for Superior was installed in 111 ft. of water in 5 days, and McDermott believes others can be installed in about 3 days.

The platforms later can be picked up for relocation by severing the piling at the base—the same standard procedure following in shifting steel platforms.

Charles L. Graves, McDermott's vice president, estimates that an aluminum platform can be removed and relocated for about one-half the cost of installing a new aluminum structure. This is a key reason behind Graves' conviction that the platform has a big future at Maracaibo.

The aluminum platforms cost $170,000 to $200,000. Maximum would be $230,000 in the lake's deepest waters. Graves says steel platforms, without cathodic protection, cost about $15,000 to $25,000 less than the aluminum and that the cost of aluminum is comparable with that of concrete.

The saving over steel, according to Graves, lies in the long-term protection from corrosion and shortened erection time. No steel has been developed to withstand corrosion, and paint won't last.

He estimates the aluminum structure will reach the break-even point with steel after being in water 10 to 15 years. Based on corrosion tests made by Creole Petroleum Corp., an aluminum structure should have a reasonable life of 30 to 40 years and

an optimum of 60 to 70 years. This, says Graves, should whip the corrosion problem for the life of the concessions.

Special problems . . . Builders of the aluminum jacket had to solve a number of problems.

To assure permanent insulation between the steel piling and the aluminum jacket, they pour grout into the space between the two.

To eliminate possible bimetallic corrosion, McDermott engineers designed and installed large rubber gaskets for the top and bottom of each of the four frame legs.

The first four structures were fabricated in McDermott's yard near Morgan City, La., and towed upright on one barge to Maracaibo, where they were installed by a McDermott derrick barge. The first platform went to Superior, while two others went to a combine operated by Signal Exploration Co. and one to a combine operated by Venezuelan Sun Oil Co.

Roy R. Striekert, design engineer for McDermott, handled design of the structure. Robert Dalrymple, chief corrosion engineer for Reynolds Metals, assisted with the design.

Refinery for East

Commerce lets contract on 43,000-bbl. custom plant

JAMESTOWN, R. I.—Commerce Oil Refining Corp. is finally ready to go on construction of its long-talked 43,000-bbl. refinery near here.

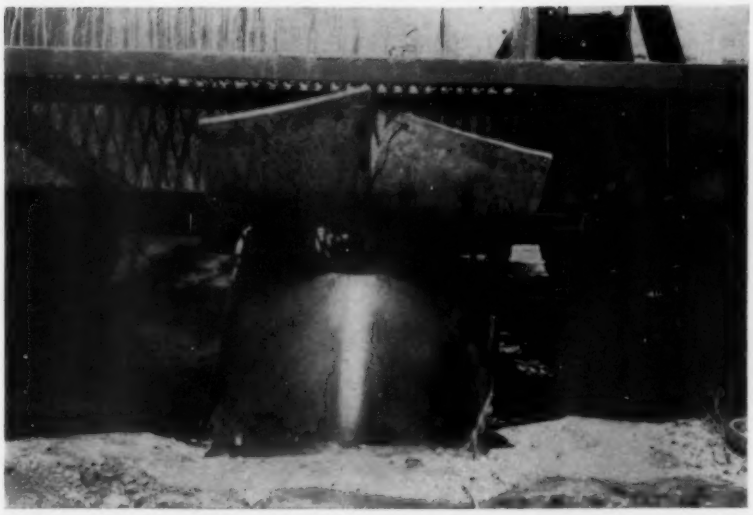
After more than 2 years of planning and numerous design changes, the company announced last week it is signing Fluor Corp., Ltd., to build the ultra-modern, custom-processing plant. At least four other major contractors had bid on the job.

Flow plans and unit specifications are complete and Fluor is ready to move in for actual construction. The contract calls for the refinery to be finished within 21 months.

Universal Oil Products Co. is the architect engineer. The company is licensing Commerce to use its catalytic cracking, Platforming, Unifining, Penex polymerization, and other processes.

Much of the original process planning was done by Lummus Co., which was expected to get the construction contract until competitive bidding ruled it out.

The company has contracted to buy crude and sell products to Gulf Oil Corp. on a custom-refining basis (OGJ, June 3, p. 61).



THIS 18-in. jet flame disintegrates toughest rock at fastest rate. Guard flaps are folded back for photograph. Below is a full jet-piercing drilling rig.

New Drill Bit Burns Fuel Oil

A DRILLING TOOL based on the rocket-jet principle is piercing rock 10 times as fast as conventional methods.

But nobody knows yet whether it can ever be adapted to shot-hole or oil-well drilling. Such possibilities haven't yet been explored, and its developer sees too many problems at the moment.

The new technique, called "jet piercing," was developed by Linde Co., a division of Union Carbide Corp., for blasting through spallable rocks such as granite, syenite, quartzite, sandstone, and taconite.

The deepest hole yet to be drilled is 160 ft.

The new rock-drilling process uses heavy fuel oil or kerosine with oxygen and water. Flame jets reach a velocity five times the speed of sound and a temperature of 4,000° F.

Combustion gases and steam continuously blow out rock particles loosened by the jet. Flame combustion and action are controlled by a blowpipe suspended from a crawler carrier.

The only limit to penetration depth is the length of the hoses carrying oxygen, fuel, and water.

Used for Seaway . . . Jet-piercing's best success has shown up in drilling taconite, known as the meanest rock on earth, and the Potsdam sandstone, now being blasted away for the St. Lawrence Seaway.

In this project, jet piercing has sunk, in one shift, a 100-ft. hole that would take a week to dig with conventional churn drills. Rocks which resist bit drilling readily disintegrate or spall when hit by the rocket flame.

The Linde company says the jet flame represents one of the highest concentrations of energy available to man. At its highest velocity, the flame has a mechanical energy equivalent to about 500 hp., and yet this energy is contained in a flame not more than 18 in. long and 2 in. wide.

Seven refining units are mothballed as . . .

Esso Backs Off in Baltimore

● Ax falls on overcrowded refinery in big drive to cut operational costs; Baton Rouge and Linden will fill gap

BALTIMORE.—In a major economy move, Esso Standard Oil Co. has permanently closed most of its 69,800-bbl. refinery here. By the end of this month, manufacture of gasoline, heating oil, fuel oil, and coke will come to an end.

Units used in crude distillation, fluid catalytic cracking, fluid coking, catalytic reforming, hydrogen treating, and alkylation will be mothballed until the company decides what to do with them.

Esso will continue to make asphalt and greases at the plant, and lube-oil blending and packaging will remain. The local distribution and marketing setup will switch to products brought in from other Esso refineries.

The local payroll will be cut to about 200 men in the plant proper. The 700 employes engaged in distribution and marketing will not be affected.

About 115 older, long-service employes will be offered early retirement. Others will be transferred to affiliated refineries if possible. The rest—about 500—will be laid off with generous severance allowances, Esso said.

A special coordinator has been assigned to place as many employes as possible in jobs with Jersey companies, or other firms in the Baltimore area. A vocational-guidance counselor has been retained to aid in placement work.

Why the closedown . . . What prompted this move? Esso spokesmen said the principal reason is the physical limitations of the refinery site on Baltimore's waterfront. It's another case of a plant being crowded and cut up to the extent that productivity can't be increased to a competitive level.

The 115-acre site is crisscrossed by railroads, city streets, and major highways. A cemetery and a new tunnel add to the mishmash. The refinery is cut up into 21 separate parcels of land.

The city recently repealed tax exemption on manufacturers' equipment and inventory. This was not the major factor in closing the fuels refinery. But increased taxes have closed other plants, and this move probably weighed the decision for Esso.

Labor relations were not a factor. Esso says relations have been excellent. The refinery has been uneconomical for some time, despite serious efforts by labor and management to bring it back into the black.

Nor is Baltimore an obsolete refinery from the standpoint of modern processing units. A $25-million building program was completed just 2 years ago in an effort to hike productivity. This included fluid coking, Powerforming, Hydrofining, a new warehouse, and new office facilities. A $750,000 project expanding the deep-water terminal and providing docking facilities for large tankers is now under way.

What it means . . . Baltimore is being reduced to a specialties plant. It will continue to operate a 20,000-bbl. pipe still for asphalt, although operations may not maintain this level in a seasonal business such as this.

The Baltimore plant's 69,800-bbl. capacity represented 10 to 11 per cent of Esso's total crude capacity in its six refineries. It contributed about 6 per cent of the firm's total fuels production.

The closedown will not put Esso in the market for gasoline, heating oil, or fuel oil. The bulk of Baltimore's production will probably be replaced out of Baton Rouge, La., and Linden, N. J.

Esso has been operating its refineries this summer at an average of about 80 per cent of capacity. This slack is more than enough to take care of the gap.

In view of this, it's very unlikely that Esso will build elsewhere immediately. Like other companies, Esso has been looking up and down the East Coast for refinery sites for the future. The Chesapeake Bay area has been explored thoroughly, but without success.

Four years ago, with an eye to the distant future, Esso did purchase 846 acres on the Elizabeth River just west of Norfolk, Va. This tract is considered one of the few ideal refining sites still available along the coast.

Of course, long-range plans for building a Virginia refinery could be updated in the future because of the Baltimore closing, but there are no plans at present along that line.

Economy . . . The Baltimore move is just a part of an over-all economy program aimed at reducing operational costs to a competitive basis.

At its big Bayway refinery at Linden, 513 employes were released last spring. This was followed this summer by transfer and early retirement of 200 supervisory personnel.

Over the next few weeks the salaried office payroll at Bayway will be reduced by about 85. But none of these cutbacks involve reduction in refinery operations.

Ten years ago the six Standard Oil Co. (N.J.) refineries in Boston, Linden, Bayonne, N. J., Charleston, S. C.,

Baltimore, and Baton Rouge were grouped under Esso Standard. Since then it has led the industry in basic crude capacity for any single operating company.

The Baltimore closing now places Esso in second place domestically, behind The Texas Co. However, on the basis of crude capacity operated by affiliates in the same family, the Jersey group still ranks first, with Standard Oil Co. (Ind.) in second place.

Field Rules Studied

Louisiana assembles data for new allowable formula

NEW ORLEANS. — Detailed data on nine Louisiana oil fields will be compiled by the state conservation department to guide an industry committee seeking a new formula for setting production allowables.

The committee at its first meeting last week received several proposals to replace the present depth-bracket formula. New plans under study generally are based on reserves, thickness of producing sands, economic factors, and other elements not included in the present formula.

Conservation Commissioner John B. Hussey will mail forms to be filled out by operators in the nine representative fields. Operators will be asked to supply pertinent facts on reserves, pressures, costs, and other factors.

After the information is assembled, the industry committee will meet with conservation-department officials to apply yardsticks to individual fields.

British Columbia Test Hits

FORT ST. JOHN, B. C.—British Columbia has yielded its first oil from the Mississippian. Production is coming from the 11 Blueberry, about 55 miles northwest of here in an area known primarily for its lush gas reserves.

The well was brought in by Fargo Oils, Ltd., and White & Lloyd et al. It flowed light-gravity oil at the rate of 569 bbl. a day on production tests. The team which made the strike is testing two wells in the area. One is the 16 Blueberry, also in the Mississippian, about 5 miles away. The second is 12 Blueberry. The companies are drilling at two nearby locations.

The new discovery is on Province Permit 64, covering 254,592 acres. Fargo and Gulf States hold 25 per cent interest each in the area and White & Lloyd holds 50 per cent.

FPC Pops Bubble

Reverses examiner, rules gas controlled at wellhead

WASHINGTON.—What looked for awhile like a way to skirt price controls on interstate gas abruptly faded out last week.

The Federal Power Commission reversed an examiner's decision that gas which goes into an interstate pipeline before it moves beyond the christmas tree is a sale of gas "in place in the well" and not a sale in interstate commerce.

The case involved gas sold to El Paso Natural Gas Co. by Continental Oil Co. from a well in Langmat field in Lea County, New Mexico (OGJ, May 13, p. 85). El Paso takes the gas from the top of the christmas tree at a point where it enters a 4-in. by 2-in. reducing swage.

The full commission held that while Continental's valves are not used to control the rate of flow, they could be operated to discontinue the sale to El Paso completely and thereby end service.

Basically, the FPC said, the gas is sold to El Paso and delivered into its interstate pipeline. The facilities which serve the function of effecting the sale are "clearly jurisdictional," it held.

On this principle, it was ruled, it is apparent that such portions of the christmas tree that are owned by Continental and serve to contain the gas at the point of delivery are facilities for effecting the sale of gas in interstate commerce "regardless whether they serve also to effect production."

It cannot be claimed that the sale in this case could be effected without the aid of Continental's facilities, the FPC concluded.

Dakota Test Finds Heath Pay

BISMARCK, N. D.—Amerada Petroleum Corp. has indicated another discovery in the southwest part of the Williston basin. The 1 Scoria Unit recovered 5,500 ft. of highly gas-cut black oil from the Heath sand at 7,964-90 ft.

The wildcat is 4 miles west of Fryburg field and 15 miles northwest of Rocky Ridge field. There has been no drilling between the new strike and Fryburg or Rocky Ridge pools.

Fryburg, discovered in 1954, was the Williston basin's first Heath production. This was followed by discoveries at Belfield and Rocky Ridge.

Rocky Ridge was opened last winter with about 1,500 bbl. daily. But the discovery has never been confirmed.

——*Processing* briefs

Refiners are favoring electric motors over the steam turbine in new units, according to Lee B. Eddy of Universal Oil Products Co. In a paper presented last week before American Institute of Electrical Engineers, Eddy said that in recent years there has been a definite trend toward increased use of electrical motors in refineries served by U.O.P.

Petroleum derivatives can now be teamed up with agricultural products to make a new line of petrochemicals.

At the A. C. S. meeting in New York last week, Dr. Carl B. Linn of Universal Oil Products Co. revealed a new catalytic process which joins toluene, ethylbenzene, phenol, and other petroleum chemicals with ordinary table sugar, starch, cellulose, and glucose to make a wide range of new products. The products have industrial potentials as detergents, petroleum additives, pharmaceuticals, plasticizers, resins and germicides. Developed by U.O.P. and Corn Products Refining Co., the process uses hydrogen fluoride as a catalyst.

Standard Oil Co. of California is outgrowing the power plant at its Richmond refinery. The expansion of 38,000 bbl. per day in crude capacity and addition of a 20,000-bbl. cat reformer are factors in raising the plant's electrical load from 49,000 volt-amp. last year to nearly 80,000 volt-amp. by 1962. Result: Standard of California will turn to purchased electric power in the future.

Midland Cooperatives, Inc., is building a near-automatic oil-blending plant at Fridley, Minn., to produce lubricating oils for its members. The $600,000 plant, according to Midland, will be odorless and noiseless. And it will break with tradition. Instead of guarding the secrets of its operations, it will be designed to show off its inner workings to thousands of cooperative members expected to visit the plant each year.

Also for Refiners . . .

Three big refiners air first objections to imports plan before panel (p. 101) . . . Commerce Oil Refining will let Fluor build new Rhode Island plant (p. 109) . . . Esso is closing most of its Baltimore refinery (p. 110) . . . Refiners learn more about nitrogen problem (p. 114).

PLUS THESE TECHNICAL FEATURES: A report on Petrobras' Mataripe refinery expansion (p. 226) . . . COST-imating (p. 235) . . . and Foreman's Page (p. 238).

Alberta Limits Payout

● New proration system allows 9½ years to recover costs, gives more weight to well depth, ability to produce

ALBERTA'S 7,105 producing oil wells will go on a new proration schedule January 1.

Under a complex plan announced by the provincial conservation board, some wells will produce less, some more. But the net effect of the new plan will be:

... **A 9½-year limit** on Alberta's economic allowance, which is designed to enable operators to recover their costs.

... **Greater recognition of depth** in the allowance. Shallow wells will get less and deeper ones more than double present allowables.

... **Larger share of market** to high-potential wells.

... **Greater elasticity** in spacing.

... **Abandonment of the idea** that all pools should have a fixed minimum allowable.

The plan . . . Key to the conservation board plan is a two-stage depth-bracket allowable system geared to a 9½-year payout on each well.

The stages are:

... **Initial economic allowance** for the first 7 years of a field's life.

This is designed to reflect the drilling cost and part of the completion cost. The schedule ranges from 30 bbl. daily for wells up to 3,600-ft. to 190 bbl. daily for 15,000-ft. wells. Present schedule ranges from 35 bbl. daily for 2,700-ft. wells to 68 bbl. daily for 13,000-ft. producers.

... **Operating economic allowance** for 2½ years.

This allowance will cover remaining completion costs and the operating costs. The schedule ranges from 25 bbl. daily for wells under 4,300 ft. up to 73 bbl. daily for wells 14,701-15,000 ft. deep. That makes the allowances run from 80 per cent of initial allowable for shallow wells to about 38½ per cent for deeper wells.

The board announced that after adopting this system it will give greater weight to a well's maximum production rate in dividing the market for Alberta crude. Thus, it has decided to adopt a residual MPR plan effective January 1, 1960.

Under the new system a well's prorated allowable will be:

... **For first 2 years, the** economic allowable plus some fraction of its maximum production rate.

... **After January 1, 1960,** the economic allowable plus some fraction of the difference between this and MPR.

Why the change . . . The order climaxed a 3-months' study of Alberta's proration system following hearings on the matter held last May.

Proposals made at that time ranged from increasing the present economic allowables to outlawing them entirely (OGJ, July 29, p. 116).

Bulk of opinion expressed by oil men then favored increasing economic allowance of deeper wells and cutting those of shallow wells. Individual proposals included replacing the allowance with a minimum 30-bbl. per well allowable which gradually would be cut to 20 bbl. daily. Another called for an "investment economic allowance" during the first year of a pool's life supplemented later with an "operating allowance." This proposal parallels the plan finally adopted.

The conservation board views its entire plan as a compromise between extremes expressed in May. Most small companies and independents favored retaining the economic allowances to assure a well's payout. Others, including most of the majors, wanted the allowance reduced and more emphasis put on a well's potential.

The board members now feel they have retained the economic allowance system and still will give a well's MPR greater weight in determining its share of demand.

An explanation . . . The conservation board in a statement accompaning its announcement said, "any economic allowance should afford a prudent operator the opportunity to meet his operating costs and to recover both his drilling and completion costs in a reasonable period of time.

"There seems, however, very little justification for the indefinite continuance of an economic allowance which would permit the several-fold recovery of drilling costs."

The board also announced a new policy on spacing and minimum allowables for every well.

Testimony at the May hearing showed that present economic allowances encouraged drilling unnecessary wells because of the attractive payout. The board reports in the future this plan will prevail: When a new pool is discovered and it appears development on prevailing spacing will be marginal, the board will hold a public hearing. It may then increase size of the spacing unit.

Some operators last May also proposed that unpenalized minimum allowables be instituted for all pools. The board ruled equity and conservation cannot be achieved under such a plan. It announced, however, that the case of each pool would be decided on its own merits.

Harris Bill Called Last Chance

HOUSTON.—The Harris gas bill must be passed in the next session of Congress not just to preserve the gas industry but to preserve the type of enterprise and freedom of action that made the gas and other industries possible.

That was the challenge given the Independent Natural Gas Association of America by Charlton Lyons, president of the Mid-Continent Oil and Gas Association.

Chief opposition to the bill, Lyons said, is now coming from a hard inner core of socialism in Congress or from people who want to extend the power of the federal Government over all activities and to wipe out many of the fundamental freedoms on which this nation was built.

At the same time there are few crusaders for the bill. Most members of Congress are indifferent about it, he reported. This is largely because few people in the industry have shown much enthusiasm for it.

Help needed . . . Lyons exhorted his listeners to support the Harris bill wholeheartedly and build up congressional support for it during the next few months.

It is a good bill, he said, a constructive bill, and not just the enforced truce of a compromise between warring factions of the industry. It is a good bill for every segment of the industry because it takes into account all the factors that are fundamental to the welfare of each segment.

This is the industry's last chance, he said, because both the administration and the Federal Power Commission are for this bill, but the personnel and policies of both may change.

Mid East Needed

Stewart says it must fill free world's rising demand

PHILADELPHIA.—An oil-hungry free world must look to the Middle East to meet its fast-rising demand, according to Hugh A. Stewart, director of the U. S. Office of Oil and Gas.

Speaking at the fourth annual conference of the American Institute of Electrical Engineers, Stewart pointed out that an annual increase of at least 4 per cent in U. S. oil demand over the next few years is forecast. And the rest of the free world, he said, will increase its demand at double that rate.

Because of this, and the fact that Middle East reserves are at least three times those of the whole Western Hemisphere, he continued, "it is obvious why Middle East oil gets so much attention."

"Europe's expanding economy is almost entirely dependent upon the availability of this oil, and most countries of the Middle East are dependent on the European market for their oil to support their economies."

Middle East oil is also important here because we are using up oil faster than the rest of the free world. A big question, he said, is how long this can continue without seriously depleting our domestic reserves.

"Over a period of many years we have developed each year more proven reserves than we have produced during the year," Stewart said. "However, experience of the past 4 years indicates that new oil is becoming harder to find in the U. S. and that the quantity added to new reserves each year is gradually diminishing.

"Whether this is a trend which will continue is not yet clear."

Rehearing on Ratable Take

BATON ROUGE.—Sun Oil Co. has gained ground in its battle against compulsory ratable take in Louisiana.

On the company's application, State Conservation Commissioner John B. Hussey reopened the case last week. Sun was granted permission to introduce new evidence to support its contention that the state has no legal authority to force it to buy oil from all producers in University field.

The controversial ratable-take order was issued at the request of T. G. Markley, Baton Rouge independent, who said Sun refused to buy his production while purchasing from other operators in the field (OGJ, Sept. 9, p. 56).

watching WASHINGTON

. . . with Bertram F. Linz

Contraction for expansion . . .

IF oil companies follow the line of other industries they will spend maybe 5 per cent less on new plant and equipment next year.

All-industry spending for expansion will reach a peacetime peak this year. But 1958 may bring a reversal of the postwar upward trend and a gradual decline that may run through 2 or 3 years.

There is no sign that the slight drop in capital spending now foreseen is being sparked by fear of a recession. Many industries see merely that production finally has caught up with demand. This, plus a leveling off of consumer demand in some lines, will give industry a breathing spell.

The closing of the Government's rapid tax writeoff program also has been a factor. The tight money market is making it hard for many companies to expand without the privilege of writing off part of their investment over a 5-year period.

Something like $35 billion was spent on new plant under this program, about 10 per cent of it by the oil and gas industry. This, in turn, sparked expansion in other industries. All told, about $100 billion was put into new facilities over the past 3 years.

Total capital spending this year may be about $40 billion. It was $36 billion last year. Next year it is expected to be about half way between the two. And in 1959 it may be back to the 1956 level.

Tips for coal men . . .

A SENATE subcommittee had a consoling word for the coal industry. Another dozen years or so and coal won't have to worry so much about oil and gas imports or below-cost sales of natural gas.

But at the same time the mine owners were warned that unless they speed up research, oil, buttressed by shale, will be fighting them for markets for years to come.

The Senate group recently wound up a long study of coal. Although output last year was well above 1955, the industry was found to be sick. It is suffering, among other things, from an over-dose of oil and gas in its major markets.

The cure, said the group, is research. More efficient combustion, including treatment with oil and chemicals, could bring public-utility plants back to coal. Gas from coal in place, coal as a filler or pigment for rubber, and hydrogenation also were among the seven major fields suggested.

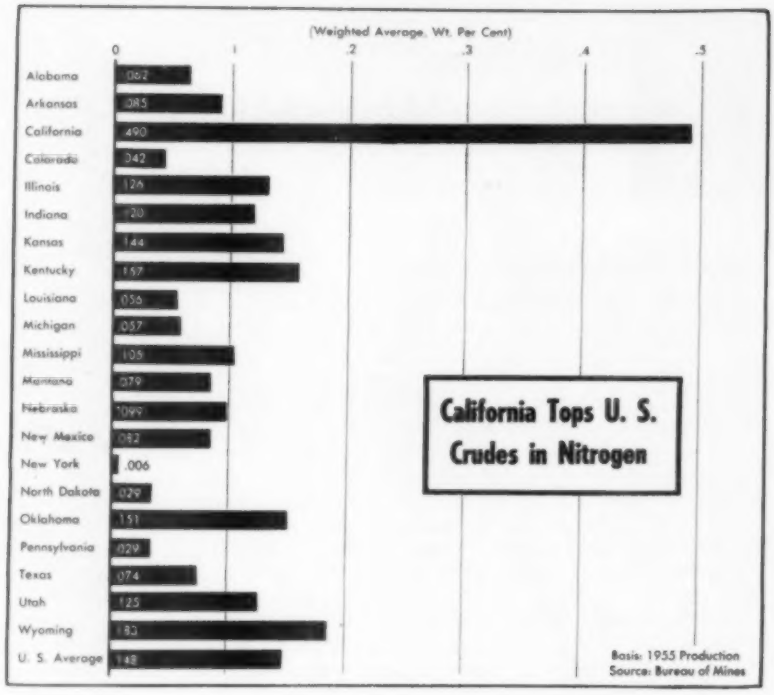
Skidding skips taxes . . .

THE Internal Revenue Service told oil operators last week they don't have to pay the federal transportation tax if they hire someone to skid a drilling rig from one location to another.

But if the contractor tears the rig down and moves it by truck the tax will apply not only to the movement but also to the tearing down and the setting up at the new location.

The IRS explained that the hauling of property on skids or rollers by a motor vehicle is not transportation by a means set forth in the law. The movement of pieces and sections of a rig from one location to another by truck is covered by the law, however.

The tearing-down and setting-up services constitute loading and unloading services furnished in connection with a taxable transportation movement, the IRS said. Accordingly, the total amount paid the carrier for loading, hauling, and unloading is subject to the tax, even though the charges for the loading and unloading may be called charges for tearing down and setting up the rig.



Refiners find out more about . . .

How to Lick Nitrogen Problem

REFINERS are well aware that nitrogen is an unwanted component of the crude oil they process. But knowledge has been skimpy on just how widespread high-nitrogen crudes are, what compounds are involved, and how they gum up processing.

Almost 20 per cent of all domestic crude is classed as high-nitrogen, with .25 per cent nitrogen or more. Most of this comes from California, but Oklahoma and Wyoming also have some high-nitrogen crudes.

Another 23 per cent of U. S. production is classed as moderately high in nitrogen. States showing a weighted average content of .10 to .25 per cent include Illinois, Indiana, Kansas, Kentucky, Mississippi, and Utah.

This was brought out by John S. Ball of the Bureau of Mines, Laramie, Wyo., in one of 10 papers presented at a special symposium at the annual meeting of the American Chemical Society in New York last week.

When the crude oil is processed, most of the nitrogen compounds wind up in the residual fractions, Ball said. But the trend toward deeper cuts for catalytic cracking feed stocks is making the nitrogen problem more acute.

Nitrogen removal . . . C. K. Viland of Tidewater Oil Co., San Francisco, illustrated how removing basic nitrogen by acid treating, hydrogen treating, or other means will pay off in higher yields of better quality gasoline.

A heavy naphthenic California gas oil with a .30 wt. per cent nitrogen was processed under identical pilot-plant conditions before and after treating for reduction to .17 wt. per cent nitrogen.

Here are the results: Conversion, 49.8 vs. 58.4 per cent; total gasoline yield, 44.4 vs. 52.5 per cent; gas-oil yield, 50.2 vs. 41.6 per cent; and research octane number of clear debutanized gasoline, 93.7 vs. 94.3.

Conversion on test runs was adjusted to give a uniform coke make of 5 wt. per cent. This resulted in carbon on regenerated catalyst of .26 wt. per cent for untreated and .15 wt. per cent for treated feed stock.

The basic nitrogen compounds affect the catalytic cracking operation by deactivating the catalyst with heavy carbon deposits, Viland explained. In addition, iron and vanadium were also reduced in acid-treating the feed to remove nitrogen, giving longer life to the catalyst.

The effect of nitrogen compounds on platinum-acidic oxide catalysts used for catalytic reforming also works against the refiner. A study reported by Socony Mobil Oil Co.'s research and development laboratory found that nitrogen deactivated the acid sites on the catalyst.

It also deactivated the platinum sites, but did not affect the isomerization rate of cyclohexane to methylcyclopentane because a sufficiently high threshold platinum activity was maintained in the Socony tests.

Union Expands Pilot

Another 7,000,000 bbl. may be added at Richfield

LOS ANGELES.—Union Oil Co. of California is getting ready to cash in on its 13-year-old pilot water flood on the Chapman lease at Richfield pool southeast of here.

By expanding the state's oldest pilot flood into a full-scale project, Union hopes to boost recovery 54 per cent. This would mean an added 7,000,000 bbl. of oil from the 143-acre lease.

It will be the state's first crestal flood, and the second largest water flood in California.

By flooding the upper Chapman zone at Richfield, Union expects to:

. . . Boost ultimate recovery to 20,000,000 bbl., or 35 per cent of the estimated 56,500,000 bbl. of oil in place. The zone has already yielded 11,000,000 bbl., with another 2,000,000 bbl. capable of being produced through primary means. The upper Chapman produces from 3,200 ft.

. . . Speed up recovery by 10 years. Most of the 30 wells in the field have been producing 30 years or more. By primary methods, estimated life span would be another 30 years. Union expects to cut this to 20 years, getting the oil out before the old wells start giving the company too much costly trouble.

Crestal flood . . . The crestal drive is being used because of an irregular oil-water contact and the decreasing thickness of the oil sand from the crest of the formation to the structural flanks.

Union plans to initially inject 6,000 bbl. of brine daily into four wells on the crest of the faulted, elongated anticline. The fault runs parallel to the eastern limits of the lease. On the northern and western flanks, the sands shale out within the lease.

As the full-scale flood progresses and the downdip wells go to water, they'll be converted to injection wells. Those on the crest will be shut in.

Maximum thickness of the pay zone is 400 ft.; net effective oil-sand thickness is about 250 ft. The oil-producing section dips from 0° to 12°. Gravity ranges from a low of 17°, where it pinches out on the northwest edge of the lease, to 22° against the fault.

Gas Gets A Warning

Connole says unwise expansion, dump sales, may use up known reserves, double replacement costs by year 2000

HOUSTON.—A comprehensive national fuels policy is necessary to conserve fossil fuels and prevent excessive expansion and unwise pricing in the natural-gas industry, the Independent Natural Gas Association of America was told by Commissioner William R. Connole of the Federal Power Commission.

Referring to the tremendous growth in demand for energy in the country, Connole quoted The Oil and Gas Journal forecast that if the present rate of consumption of natural gas continues until the year 2000, a total of 560 new trunk lines of a billion cubic feet daily capacity will be needed.

But he warned that other estimates are that by the year 2000 the natural-gas reserves recoverable at unit costs up to double today's are likely to run out, assuming present living standards and population growth rates.

"Under the pressure of these staggering demands," he said, "the known and discoverable reserves on this continent will be sorely taxed. Beyond question, if natural gas is consumed at a rate even approaching that predicted by these informed, conservative sources, our energy picture 20 years from now will be far less encouraging than that which now confronts us."

Connole said he does not question the need for expansion of gas transmission, but added:

"What I wish to underscore is the absolute necessity that the commission and the industry carefully weigh any expansion program against two overshadowing backdrops. First, unwise expansion will inevitably hasten fossil-fuels bankruptcy. Second, uneconomic pricing to maintain artificial volumes contains the seeds of its own destruction."

Costs ballooning . . . Costs of finding gas and getting it to consumers are rising faster than the demand for gas, he said, and if the price of gas to consumers should double, the demand may fall off very materially and thus make some pipeline projects uneconomic.

"If wellhead prices during the next 3 years continue the rising trend that prevailed in the 1952-56 period," Connole said, "they will average 15.5 cents by 1960, and, if the proportion this average price bears to the average cost of boiler fuel is maintained at the 1955 level, the average cost per million B.t.u. of gas used for electric generation in 1960 will be 26.3 cents.

"Yet the average cost per million B.t.u. of coal for boiler fuel was 25.2 cents in 1955, having declined from a high of 27.3 cents in 1952.

"This indicates that if natural-gas prices and coal prices on a national-average basis continue their relative trends of recent years, natural-gas prices will be beyond competing with coal sometime before 1960."

The commissioner declared that it will be disastrous for pipelines to try to keep their industrial load by selling boiler gas at unremunerative prices because this is a transient market and may one day disappear.

Connole said prices should be "carefully adjusted for two important factors; one, the intense competition between fuels and, second, the need that a pipeline make all sales at prices sufficient to recover the properly allocated costs."

He added that boiler-gas sales markedly expedite the exhaustion of a highly advantageous yet irreplaceable commodity.

As possible remedies, Connole suggested a coordinated fuels policy, long-range planning, and closer scrutiny by FPC of new pipeline projects.

O.C.A.W. Staff Is Trimmed

DENVER. — The financially pressed Oil, Chemical and Atomic Workers International Union has dismissed five international representatives as a step toward balancing the union's budget.

President O. A. Knight said additional layoffs may be necessary within a few weeks unless other alternatives are found for aligning O.C.A.W. expenses with income.

The union general fund has been running in the red for several months.

Operation in the red was continued through O.C.A.W.'s recent Chicago convention on the assumption that representatives of the union's 200,000 members would approve proposals to improve union financing. The delegates, however, rejected all proposals that would have provided economies and placed more money in the general fund.

—— *Industry* briefs

Bayview Oil Corp., Dallas, has been formed to take over and operate properties formerly owned by Byrd Oil Corp. The management of the firm remains the same following the name change, with A. M. Abernethy, Toronto financier, as president. Other officers are A. Harvey Arant, vice president, and Arch C. Baker, secretary-treasurer.

Abernethy and associates acquired control of Byrd Oil in April 1956. D. Harold Byrd, founder of the firm, was named chairman of the board. He since has relinquished this post. Bayview now operates oil properties scattered over a seven-state area.

Six new crew and supply boats for use in offshore oil operations have been ordered by Caspary & Wendell, Rockport, Tex. The vessels, ranging from 85 ft. to 136 ft. in length, will cost about $1,250,000. Burton Construction & Shipbuilding Co., Inc., Port Arthur, is scheduled to deliver the vessels by December 1.

Pan American Petroleum Corp. has opened rank Smackover lime production in Union Parish in north-central Louisiana at its 1 James, 3 miles south of Farmerville. The well flowed 225 bbl. of high-gravity oil per day on 11/64-in. choke from perforations at 10,355-68 ft.

Pan Am has full interest in the well and a 9,000-acre block in the area. Nearest Smackover production is 14 miles to the northwest at Bernice. Nearest production of any kind is 9 miles to the east in Monroe gas field.

Tekoil Corp. has purchased Reservoir Engineering Laboratories, Inc., of Dallas. The consulting engineering firm will become a division of Tekoil and continue to serve the oil industry. Laboratory facilities will be expanded but no personnel changes are planned. Tekoil, which specializes in secondary recovery, last month purchased properties which extended its operations from 8 to 17 states.

Transcontinental Oil Corp., Dallas, has bought all the oil properties of Bankers Life & Casualty Co. of Chicago. This includes properties of Col-Tex Oil Corp., National Drilling Co., Illamex Oil Co., and Lincoln Oil Co., all wholly-owned subsidiaries.

The $4,250,000 deal involves 113 oil and gas wells and 6,000,000 bbl. of reserves in Arkansas, Colorado, Illinois, Kentucky, Oklahoma, Texas, and Wyoming.

Foote Joins Defense

Oil man's stand forces Senate to review rules on conflict of interest

WASHINGTON. — Dr. Paul D. Foote, retired vice president of Gulf Oil Corp., will serve as assistant secretary of defense for research and engineering at least until the Senate gets around to reviewing its rules next year.

Following failure of the Senate to confirm him, Foote was given a recess appointment by President Eisenhower after Congress adjourned. In such cases, appointees serve until action is taken during the following session.

Foote, who has been serving as a consultant to the Defense Department since July, raised a big question of how far the "conflict of interest" rule should go when he appeared before the Senate armed services committee.

The rule requires that new government officials sever all financial or other ties they may have with companies doing business with their department.

Foote told the committee that his pension and oil stocks are a substantial part of his life savings and he could not afford to give them up. But he said he would not take part in any matter that might involve companies in which he had an interest.

Committee Chairman Richard B. Russell of Georgia said Foote had raised a valid question. He said the committee will make a study of the conflict of interest policy to see how far it should go.

Pipeline briefs

Great Lakes Pipe Line Co. last week completed one phase of its far-flung looping program. The 34-mile, 12-in. line between Tulsa and Barnsdall, which will supplement existing 12 and 8-in. lines, has been put in the ground. Midwestern Constructors, Inc., built this section. Great Lakes is getting under way on the 140-mile, 8-in. extension from Minneapolis to Superior, Wis., contracted to Laco Pipeline Contractors, Inc.

Carolina Pipeline Co., Greenville, S. C., will start work this week on a $9-million transmission system to bring natural gas to a large part of South Carolina. Carolina Pipeline will build the 177-mile system of 2 to 10-in. pipe. The project is to be completed in 120 days. Prime contractors are Panama-Williams Corp., Houston, and P. A. Buchanan, Birmingham, Ala. The line will take 23,612,000 cu. ft. daily from Trancontinental Gas Pipe Line Corp. and distribute it between Blackburg and Camden.

North Carolina Natural Gas Corp., which will build a similar system across North Carolina to take gas from Transco, expects to be operating by spring. The system includes 630 miles of 2 to 16-in. with capacity of 39,780,000 cu. ft. daily. It will originate at Mooresville and extend eastward across the state. North Carolina and Carolina Pipeline received FPC certificates over a competing proposal of Trans-Carolina Pipe Line Corp. to build an interstate system serving both states.

Union Oil Co.'s new 225-mile, 12 and 16-in. pipeline from the San Joaquin Valley to its Oleum refinery on San Francisco Bay is now pumping five streams. The line is delivering some 43,000 bbl. of crude oil and unfinished products daily. Capacity will be boosted to 70,000 bbl. daily when two pump stations now under construction are completed soon.

Michigan Wisconsin Pipe Line Co. has been denied FPC permission to increase natural-gas deliveries to existing utility customers to permit them to make new space-heating connections. The request was rejected because it was based on gas supplies now available only on a temporary basis. Michigan Wisconsin is expected to refile the application.

Gillette Pipeline, Inc., and A. W. Hartwig, Inc., plan to build a 103-mile crude line costing $2,500,000 from Dead Horse Creek field to Casper, Wyo. Size of the line hasn't been determined.

Gillette and Hartwig have applied for a permit from the Wyoming Public Service Commission. Crude from Dead Horse Creek, located 30 miles west of Gillette, could be sold to three refineries in Casper or transshipped by two major pipelines. Charges of 10 cents per barrel for gathering and 25 cents for transportation are proposed.

Transcontinental Gas Pipe Line Corp. has temporary FPC approval to build 44 miles of 30 and 36-in. loop line costing $6,368,000. This is part of Transco's $61,500,000 project on which hearings were completed last month. Looping will raise Transco capacity from 877,000,000 cu. ft. daily to 921,700,000 cu. ft. daily. The FPC withheld authority to operate the new facilities.

Revenue and volume of crude and products lines declined the second quarter this year from the first quarter, when crude lines had abnormal shipments because of the Suez shutdown. Revenue was down 7 per cent to $163,431,937 from the first quarter and 0.4 per cent from the second quarter of 1956. While volume was up 50 million barrels to 1,174,007,889 bbl. over a year ago, it declined 69 million barrels from the first quarter.

Also for Pipeliners . . .

First crude moves over Interprovincial's extension to Toronto refining area (p. 103) . . . Here's an idea on what to do when a news reporter calls (p. 104) . . . FPC reverses examiner, rules gas is controlled at the wellhead (p. 111) . . . Gas men warned Harris bill might be their last chance (p. 112) . . . FPC member says unwise expansion, dump sales may use up gas reserves (p. 115).

PLUS THESE TECHNICAL FEATURES: A special 60-page Journal report on the pipeline industry (p. 124-218) . . . and Pipeline Patrol's construction survey (p. 245).

Sinclair, Newmont Make Sahara Deal

● **Two American companies will hold 45 per cent interest in concession, three French firms remainder; B.P. plans to apply for Algerian tract, and Jersey is "interested"**

TWO MORE AMERICAN companies joined the race for oil exploration acreage in Algeria's Sahara Desert region last week by taking on French partners.

The two, Sinclair Petroleum Co. and Newmont Mining Corp., have virtually assured themselves a piece of the Sahara by conforming to the French pattern. They have allied themselves with a French Government oil company, a French investment company, and French banking interests.

British Petroleum Co., Ltd., revealed last week it will apply for Sahara acreage before the September 23 deadline, but the applications had not yet been made last week.

Standard Oil Co. (N. J.) describes itself as "interested," but company spokesmen insisted last week that the American major has made no deal with any French company or capital interests for an application.

B.P. said it would make an application as soon as the company completes negotiations for a 50 per cent interest with French financial interests. The British company has an affiliate, Ste. Francaise des Petroles B.P., which is already active in exploration in metropolitan France.

Sinclair and Newmont will take a back seat financially in the Algerian deal. The two American companies will hold 45 per cent interest while the French interests will hold 55 per cent.

Last week, Cities Service Co. took on two French oil companies in a similar move, but Cities Service will have a full half interest (OGJ, Sept. 9, p. 76).

Sinclair will almost certainly be the operator for its entire group on any acreage it gets. The group has filed applications for several tracts distributed over the greater Sahara area.

The three French partners are Ste. Francaise de Recherches et d'Exploitation du Petrole, a subsidiary of the French Bureau de Recherches de Petrole; Messrs. Lazard Freres et Cie., Paris banking firm; and l'Omnium de Valeurs Agricoles Industrilles et Minieres, an investment company.

Sinclair Petroleum will have a 27 per cent interest in the venture and Newmont Mining's share will be 18 per cent. The French oil company will have 27 per cent: Freres banking interests, 18 per cent, and the de Valeurs investment company 10 per cent.

Oil fever spreads . . . At least another dozen American companies, majors, independents, and individual oil operators, have expressed an interest in the Sahara since two French companies gave up about 23,000 sq. miles of concessions (OGJ, Aug. 19, p. 113).

The government gave companies until September 10 to make applications, but later extended that date another 2 weeks. Those applying must have at least a 50 per cent French partner.

The interest shown by oil companies can't begin to match that of the man in the street in Paris. Oil strikes made in the Sahara by French government-dominated companies have fired imagination and hope in oil-hungry France.

Last week in Paris, a $33-million public stock issue for a holding company to finance oil exploration was oversubscribed in less than 3 hours.

It was one of the largest transactions of its kind in French financial history. The 1,400,000 shares were snapped up almost on sight by investors. More than 1,000 eager would-be buyers were waiting outside the doors when the two banks which underwrote the issue opened for business. One of the banks was Lazard Freres et Cie., one of Sinclair's new partners.

Sinclair a veteran . . . Sinclair will be a newcomer to the Sahara, but not to Africa. The company has done a lot of exploration in areas similar to the torrid desert it now wants to look at.

Sinclair Somal Corp., owned jointly by Sinclair and Conorado Petroleum Corp., is now drilling its second deep wildcat in Somalia on the northeast coast of Africa.

Sinclair early this year gave up its concession over the entire country of Ethiopia after an intensive exploratory program. The company quit Ethiopia after negative results in a shallow and medium-depth drilling program. It had already drilled two deep tests that were unsuccessful.

Newmont Mining is no newcomer to the oil industry, but this is its first foreign oil venture. Newmont Oil Co., a wholly owned subsidiary, has oil interests in several areas of the United States. It has been active in the last several years in joint ventures with both Magnolia Petroleum Co. and Continental Oil Co. in developing production in the offshore areas of the Gulf of Mexico. Newmont is a major stockholder in Continental.

Honduras Areas Opening Up

MORE THAN 3,000 sq. miles of British Honduras will be open for oil exploration next month.

British Honduras Gulf Oil Co., which has had concession rights over the entire British Crown Colony on the Caribbean between Mexico and Guatemala, will give up part of its territory. Gulf will select 1,000 sq. miles in the southern half of the country which it intends to keep. Gulf has until October 20 to make the choice.

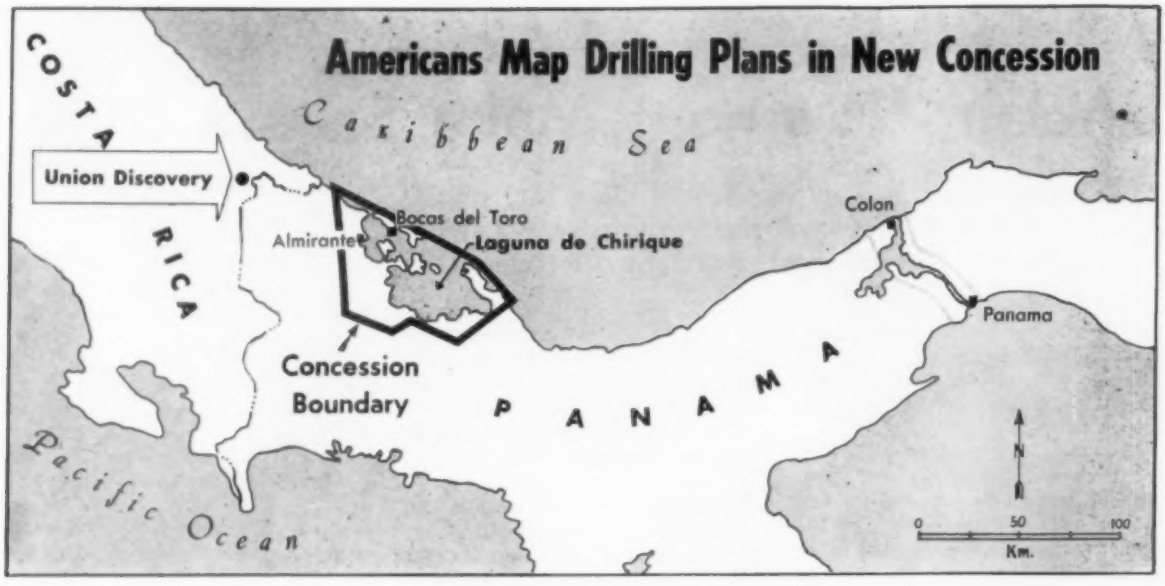
Gulf's rights in the north, where the company has drilled two dry holes, have been extended for another year. The company halted drilling and released a contract rig late last year after drilling its second dry hole (OGJ, Nov. 19, 1956, p. 152). The colony's first test was drilled by Gulf in June 1955.

Jamaican Test Abandoned

PAN JAMAICAN OIL CO. last week abandoned its third dry hole, the fourth drilled so far, on the Island of Jamaica.

The latest duster was the 1 West Negril on the southwestern tip of the island in the Negril Hill area. It was abandoned at 9,244 ft. The test was a mile west of 1 Negril, the first well drilled on the island. The first hole was drilled by Base Metals Mining Corp., Ltd., which later farmed out the entire island to Pan Jamaican.

The company's other two dry holes were 1 Santa Cruz, abandoned at 8,732 ft., 5 miles south Malvern, in St. Elizabeth Parish, and 1 Cockpit, about 40 miles to the north of the 1 Santa Cruz in Trelawny Parish.



Champlin Closes Deal in Panama

● Two wildcats will be sunk in early 1958 in lagoon area near Costa Rica; Kerr-McGee and Southland Royalty also have interest in 270,000-acre coastal concession.

THE REPUBLIC of Panama will see its first oil drilling in many years within the next 6 months.

Champlin Oil & Refining Co., Fort Worth, last week exercised its option to take out a concession on roughly 870,000 acres in the northwest corner of the country near the Costa Rican border.

Champlin acted as operator for a group of U. S. independent firms making its first bid to develop oil production outside the United States. Its associates in the Panamian venture are Kerr-McGee Oil Industries, Inc., Oklahoma City, and Southland Royalty Co., Fort Worth. Champlin has a half interest in the operation and Kerr-McGee and Southland Royalty each have 25 per cent.

To drill offshore . . . Acting in its role as operator, Champlin took the concession on the basis of encouraging results of an intensive land, sea, and air exploration program it launched early this year.

Roughly three-fourths of the entire concession area is submerged acreage underlying lagoons and bays. And it is here that the exploration campaign has been pushed hardest and where first drilling will begin.

Champlin will drill two wildcats during the first quarter of 1958 in the south central portion of the Laguna de Chiriqui, a big island-dotted lagoon on the north coast.

Staking of exact locations awaits a final sifting and evaluation of the immense volume of seismic data by 20 data interpreters on the staff of Western Geophysical Co., Shreveport, which carried out the seismic portion of the exploration program under contract from Champlin.

December target . . . Champlin expects to dispatch drilling equipment and supplies to the area in December. It currently is debating whether to go to a mobile or a fixed-type platform. One of the projected wildcats will be drilled in about 120 ft. of water, the other where lagoon waters are about half that deep.

Present plans call for towing drilling equipment all the way from the U. S. Gulf Coast—a jaunt of about 1,800 nautical miles. Maximum towing speed is about 3 miles an hour, and the voyage is expected to take nearly a month.

The local supply base for drilling operations will be set up either at Bocas del Toro on Columbus Island or at Almirante about 15 miles away on the coast. These are the only two villages of any consequence in the concession area.

Bocas del Toro boasts deep-water port facilities. The island also has a rough landing strip where light drilling supplies could be landed and then ferried to the drilling site if the need arises.

Oil prospects good . . . Champlin is highly encouraged over the prospects for developing oil in commercial quantities following an analysis of the fruit of its exhaustive exploration program.

The company took an option on the concession it now holds early this year. It sent two surface parties to the area the last of January to kick off exploration.

Surface reports were favorable, and the company dispatched two Western Geophysical seismic crews equipped

Delhi-Taylor Granted Panama Concession

PANAMANIAN DELHI Petrolera, Inc., an operating subsidiary of Delhi-Taylor Oil Corp., Dallas, will develop an oil and gas concession of 1,660,000 acres in Panama.

Company officials said last week the Republic of Panama has approved the concession, located in the Darien Province near the Columbian border. Negotiations for the concession began last November.

Frank L. Greene, who has conducted exploration activities in Central American countries for 3 years, will be resident manager for Delhi-Taylor at Panama City.

OPERATING BASE for Champlin Oil & Refining Co. in Panama will be either at the Columbus Island village of Bocas del Toro (shown above) or at Almirante on mainland.

with 110-ft. boats to map the submerged areas of the concession early in March.

Reflection seismic records were obtained over an area covering more than half a million offshore acres. Seismic crews during the months of shooting used up 175,000 lb. of dynamite. Along with the reflection seismic work, Champlin ordered extensive refraction seismic work done to establish the depth of the sediments in the area.

Surface geological work by the two surface parties was supplemented by aerial photo geology carried out by Geophoto Services Co.

The combined exploration data disclosed that:

. . . **Sediments** are 12,000 ft. thick at least under the concession.

. . . **The drill** will penetrate Miocene, Oligocene, and Eocene sediments.

. . . **Numerous** anticlines and folds with pronounced closure or relief lie under the concession.

Along with these favorable factors, the Champlin acreage lies in the same sedimentary basin and is only about 25 to 30 miles east from the noncommercial but encouraging strike made last year by Union Oil Co. of California just across the border in Costa Rica.

Company has confidence . . . Earl Baldridge, president of Champlin, told the Journal last week that Champlin is convinced that adequate source beds exist under the concession.

"The exploratory program has indicated that the structural conditions for satisfactory oil traps are there," Baldridge said, "and if we find adequate reservoir beds with sufficient porosity and permeability, we think we'll also find important oil deposits."

Baldridge said Champlin chose the acreage it now has for two reasons. One was that prospects for finding oil in that area appeared as favorable as—if not better than—any other area in Panama.

The second was that the area is more accessible. It can be reached by water, whereas most of the country is covered by heavy jungle, making for unusually difficult and costly exploration and drilling operations.

Champlin, Baldridge said, expects to stake exact tests about October 1, when final interpretation of seismic data is available.

Concession provisions . . . Champlin's concession is for 40 years. For the first 20 years, the owners will operate under the republic's existing petroleum law. The law requires, among other things, payment of 16⅔ per cent royalty to the government if production is established.

For the second 20 years, Champlin must operate the concession under tax and royalty laws then in force.

Tanker Ills Spread

Skidding rates hit crude prices, fleet operations

TWO SEPARATE EVENTS last week showed the influence of falling tanker rates on the world oil trade. Here's what happened:

. . . **Crude prices were cut** 10 cents a barrel at Eastern Mediterranean pipeline terminals by Esso Export Corp., a key offtaker company.

. . . **A spanking new tanker was mothballed** in Sweden in protest against low rates.

Esso posted a price of $2.59 per barrel for Saudi Arabian crude f.o.b. Sidon, Lebanon, and Iraqi crude f.o.b. Tripoli, Lebanon, and Banias, Syria.

Esso made the reduction to offset lower transportation rates on crude which moves all the way from the Persian Gulf by tanker. At Ras Tanura, for example, 36°-gravity crude was being lifted for $2.12 per barrel and moved to markets cheaper than the crude which went part way by pipeline.

The tanker which went into mothballs was a 30,000-ton vessel built in Sweden for a Norwegian tanker operator. It will wait out the rates slump near Oslo since the owner balked at chartering it for 5 to 7 years at current prices.

Higher rates seen . . . Scandinavian tanker men think rates can only go up, and that they will do so this winter.

Spot charter rates, in the meantime, were down to USMC less 77½ per cent for a single trip from the Persian Gulf to California for 46,500-ton dirty vessels. For a 23,000-ton tanker to France, the fixture was USMC less 65 per cent. From Sidon to the United Kingdom, it was Scale less 55 per cent.

In the U. S., single voyages from the Gulf to north of the Hatteras were chartered for USMC less 35 per cent for both clean and dirty vessels. A single voyage from the Caribbean to U.S. north of the Hatteras was arranged at USMC less 55 per cent.

38 ships idle . . . As of last week there were 38 tankers laid up or idle as owners berthed their ships rather than buck the tide of low charter rates.

Dietze, Inc., New York tanker brokers, compiled a list of the idle ships. The brokers found that four are U. S. flag vessels with a total deadweight tonnage of 66,375 tons. The 34 foreign flag tankers that are idle total 431,764 deadweight tons.

Continental Will Test New Gulf of Paria Concessions

THE FIRST wildcat in the new concession area of Venezuela's Gulf of Paria will be spudded by mid-October.

Drilling tender built for Loffland Brothers Co., Tulsa, moved out of Orange, Tex., last week and should arrive by October 1.

The tender will drill four locations in the concession area operated by Continental Oil Co. Four drilling permits have been issued.

Operating headquarters will be located at Guiria, on the Parian Peninsula, where docks are being built. The peninsula forms the north shore of the gulf.

Four drilling platforms are now en route by barge to the drilling area. The platforms, built by Brown & Root, Inc., will be erected in time for Loffland to start drilling by October 15.

The Loffland rig will be the first in the gulf since Venezuela granted concessions on some 210,000 acres last February. The costly acreage is near Pedernales field along the Venezuelan shoreline and Soldado field in the gulf off Trinidad.

Continental is operator of concession Blocks 9-14. Continental, The Texas Co., and Ohio Oil Co. own 25 per cent each, while Cities Service and Richfield Oil Corp. jointly own the other one-fourth (OGJ, Mar. 25, p. 118).

The new tender now en route to the concession area is named for Orville Fisher, southern regional vice president for Continental. It is similar to four other Continental tenders operating in the Gulf of Mexico.

The tender was built by Levingston Shipbuilding Co. at Orange. Although it is equipped for quartering 50 men, Loffland plans to have only 15 men aboard permanently.

Just how deep the wildcat will go is unknown. Production at Soldado to the east is from about 4,500 ft., while at Pedernales it is twice that depth.

The wildcat represents the start of new exploration which concession holders hope will make the Gulf of Paria another Lake Maracaibo. In addition to the Continental group, those with new concessions, still untested, are Pan American Petroleum Corp., Cia. Shell de Venezuela, and Atlantic Refining Co.

Jordan Drilling Deal Is Made

AMERICANS will operate the second exploration concession granted in the Hashemite Kingdom of Jordan.

The concession, which covers one-third of the Arab country, was granted last month to Jorge Zimeri, Guatemalan financier whose family lives in Bethelehem (OGJ, Aug. 19, p. 116).

Zimeri last week concluded a deal with J. W. Sparks, Texas drilling contractor and independent operator, and several associates to work the concession. Zimeri will retain an override.

Sparks lives in Gladewater and has production in East Texas, northeast Mississippi, and Arkansas.

Robert Tyson, petroleum engineer, and Harvey H. Hutchins, attorney, both of Jackson, Miss., are associated in the venture with Sparks.

The new operators expect to go to Jordan next month for the formal transfer of the concession. The deal already has been approved by the Jordanian cabinet.

The new group plans to begin surface geology work in the area about November 1. This will be followed by an airborne magnetometer survey and detailed seismic work. They hope to ship a rig to Jordan within a few months.

One well drilled . . . E. W. Pauley, Los Angeles independent operator, is now drilling below 5,000 ft. in the Mashash area about 30 miles east of Amman, the capital city. Pauley's well is the first ever drilled in Jordan.

Pauley spudded his test in July after obtaining the first concession granted by the present independent kingdom. Pauley has one-third of the country under concession.

Trans Jordan Petroleum Co., Ltd., a subsidiary of Iraq Petroleum Co., once had a concession over the part of the country which was Trans Jordan before the Arab-Israeli war. The concession did not cover any of what is now West Jordan. The I.P.C. affiliate never drilled a well.

Opinions differ . . . Geologists point out that the sedimentary rocks underlying part of Jordan are Cretaceous, the same age as those which produce in other Middle Eastern countries, but they disagree on other evaluations of Jordan's prospects.

Some believe Jordan's sedimentary areas were laid down in a part of the Mediterranean geosyncline. This is separated by a structural high from the prolific Mesopotamian basin, where most of the Middle East's fields are located.

Lake Rigs Moved

Superior is seeking more production at Maracaibo

SUPERIOR OIL CO. of Venezuela last week moved both of its Lake Maracaibo rigs to the west of its second successful wildcat to see if the 7,744-acre block is really as good as the first two wells indicate.

Superior paid the top bonus of $2,831 an acre for the national reserve acreage in the mid-lake area. So far it has been easily the most successful of any of the new companies in the lake (see related story, p. 108).

The two rigs have moved to locations for Lama 6 and Lama 7. Both lie less than a mile to the west of Lama 5, the best of the two wells Superior has so far completed.

The company has completed Lama 1 and Lama 5 for a combined flow of more than 10,200 bbl. daily. They are producing from separate Eocene pays from below 7,400 ft. Superior plans a twin well to No. 5 which it expects to dually complete in the Miocene and in the lower Eocene.

Here's how the first two wells were completed:

. . . Lama 1, in the northeast corner of the acreage block, was completed flowing from two Eocene pays. The upper zone flowed 885 bbl. daily through a ½-in. choke with 610-psi. tubing pressure and a gas-oil ratio of 627:1. This flow was from perforations from 7,454 to 7,570 ft.

A lower zone flowed 1,680 bbl. daily through a ⅝-in. choke with 360 psi. tubing pressure and a gas-oil ratio of 407:1. The lower zone perforations were at three intervals, 7,656-70 ft., 7,685-7,710 ft., and 7,725-66 ft.

The upper zone crude is 30.7° gravity and the lower zones test 30°. Both are sweet.

. . . Lama 5, 2 miles to the south and slightly west of the first well, was completed for 7,656 bbl. daily of 35.7°-gravity crude flowing through a ⅞-in. choke with 960 psi. tubing pressure and a gas-oil ratio of 600:1.

The flow was from perforations of two intervals, 7,590-7,645 ft. and 7,675-7,724 ft.

S.P.E.-A.I.M.E. Meets Next Month

DALLAS.—Seventy-five technical reports on the oil industry will be presented here October 6-9 at the annual fall meeting of the Society of Petroleum Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers.

Opening-day activities will be confined to a section conference at 2 p.m. Morning and afternoon sessions the following 3 days will be devoted to reading of the technical papers at the Statler Hilton, Baker, and Adolphus hotels.

Social events include a party Monday night and a dinner-dance Tuesday night. Registration is at the Statler Hilton. Following is the program schedule:

SUNDAY, OCTOBER 6

1 p.m.—Registration, Statler Hilton Hotel.
2 p.m.—Petroleum Section Conference, Statler Hilton.

MONDAY, OCTOBER 7

9 a.m.

Reservoir Fluids, Adolphus Hotel

"Compressibility of Under-Saturated Hydrocarbon Reservoir Fluids," A. S. Trube, Tidewater Oil Co.

"Development of Composite Vaporization Ratios for Oil and Gas Separation Processes," J. M. Campbell and J. A. Latham, University of Oklahoma.

"Investigation of Variables Influencing Three-Stage Separation of Oilfield Hydrocarbon Effluents," J. M. Campbell and K. F. Whinery, University of Oklahoma.

Water Flooding, Baker Hotel

"Model for Mechanism of Oil Recovery from Porous Matrix Due to Water Invasion in Fractured Reservoirs," J. S. Aronofsky and L. Masse, Magnolia Petroleum Co., and S. G. Natanson.

"Use of High-Speed Computers for Predicting Floodout Patterns," D. G. McCarty and E. C. Barfield, Humble Oil & Refining Co.

"Application of Empirical Data in Forecasting Waterflood Behavior," P. C. Schauer, Jr., Carter Oil Co.

"Inclusion of Radial Flow in Use of Permeability Distribution in Waterflood Calculations," P. S. Ache, Jr., Shell Oil Co.

Economics and Management, Statler Hilton

"Linear Programing Model for Scheduling Crude Oil Production," A. S. Lee and J. S. Aronofsky, Magnolia Petroleum Co.

"Appraisal of Producing Properties and Profitability of Proposed Capital Expenditudes," J. J. Arps, British-American Oil Producing Co.

"Methods for Calculating Profitabilities," F. Brons, and M. W. McGarry, Jr., Shell Oil Co.

"Bank Loans on Gasoline Plants," F. E. McGonagill, Jr., Bank of the Southwest.

"Present and Future Production Requirements of Oil Industry in California and Louisiana," P. G. Cook, Union Oil Co. of California.

2:15 p.m.

Reservoir Engineering, Adolphus Hotel

"Attic Oil," J. W. Killian and C. Van Der Poel, Shell Development Co.

"Reservoir Analysis Based on Gravity Segregation for Pressure Maintenance Operations," J. C. Martin, Creole Petroleum Corp.

"Method for Predicting Pressure Maintenance Performance for Reservoirs Producing Volatile Crude Oil," R. H. Jacoby and V. J. Berry, Jr., Pan American Petroleum Corp.

"Use of Digital Computers for Predicting Recovery from Thin Oil Columns," H. H. Rachford, Jr., R. D. Taylor, and P. M. Dyke, Humble Oil & Refining Co.

"Application of Centrifugal Model to Study of Reservoir Behavior," R. J. Goodwin, C. G. Massey, and P. B. Crawford, Texas Petroleum Research Committee.

Drilling, Statler Hilton

"Effect of Pressure on Rock Drillability," J. R. Eckel, Humble Oil & Refining Co.

"Application of Low Frequency Percussion to Hard Rock Drilling," E. Topanelian, Jr., Gulf Research & Development Co.

"Field Test of High-Speed Low-Torque Drilling Device," G. E. Cannon, Humble Oil & Refining Co.

"Development and Field Testing of Core Barrel for Recovering Loose Sands," A. B. Hildebrandt, H. C. Bridwell, and J. M. Kellner, Carter Oil Co.

2:45 p.m.

Water Flooding, Baker Hotel

"Flood 12, A Retrospective Look at a Profitable Water Flood," S. F. DeVore and F. F. Wright, Sinclair Oil & Gas Co.

"Studies on Pilot Water Flooding," M. J. Fischer and C. S. Matthews, Shell Development Co.

"Waterflood Operations, Loudon Pool, Illinois," M. E. Fox, Carter Oil Co.

TUESDAY, OCTOBER 8

8:30 a.m.

Drilling, Adolphus Hotel

"Volume Requirements for Air or Gas Drilling," R. R. Angel, Phillips Petroleum Co.

"Cutting Lifting Ability of Air at Pressures Above Atmospheric," K. E. Gray, University of Tulsa.

"Chemical Removal of Colloidal Mud Solids from Water," J. P. Gallus, J. L. Jummus, and J. E. Fox, Jr., Pan American Petroleum Corp.

"Practical Utilization of Theory of Bingham Plastic Flow in Stationary Pipes and Annuli," J. C. Melrose, J. G. Savins, W. R. Foster, and E. R. Parish, Magnolia Petroleum Co.

Water Flooding, Baker Hotel

"Solutions of Immiscible Displacement Equations Without Triple Values," W. T. Cardwell, Jr., California Research Corp.

"Linear Waterflood Behavior in Water-Wet Porous Media," J. R. Kyte and L. A. Rapoport, Carter Oil Co.

"Calculation of Linear Waterflood Behavior Including the Effects of Capillary Pressure," Jim Douglas, Jr., P. M. Blair, and R. J. Wagner, Humble Oil & Refining Co.

"Theoretical Description of Water-Drive Process Involving Viscous Fingering," P. Van Meurs and C. Van Der Poel, Koninklijke/Shell-Laboratorium.

Reservoir Engineering, Statler Hilton

"Limitations on Pressure Predictions in Water-Drive Reservoirs," L. H. Simons and H. H. Spain, Humble Oil & Refining Co.

"New Integrated Material Balance Equation for Reservoirs Containing Only Oil and Water—Line Drive," L. B. Lesem and G. W. Crawford, Texas Petroleum Research Committee; and W. T. Guy, Jr., University of Texas.

"Extensions of the Muskat Depletion Performance Equation," R. D. West, Mene Grande Oil Co.

"Wave Theory and Free-Surfaces," G. Rowan, British Petroleum Co.

2:45 p.m.

Production Engineering Adolphus Hotel

"Two Phase Flow in Well Flowlines," B. T. Yocum, Arabian American Oil Co.

"Pressure Fall-Off in Water Injection Wells," P. Hazebroek, H. Rainbow, and C. S. Matthews, Shell Development Co.

"Study of Anomalous Pressure Buildup Behavior," G. L. Stegemeir, Shell Oil Co., and C. S. Matthews, Shell Development Co.

2:15 p.m.

Solvent Flooding, Baker Hotel

"Diffusion Model to Explain Mixing of Flowing Miscible Fluids in Porous Media," J. S. Aronofsky and J. P. Heller, Magnolia Petroleum Co.

"Equations of Motion for Linear Miscible Displacements," G. H. F. Gardner, Gulf Research & Development Co.

"Miscible Fluid Displacement in Porous Media," J. W. Lacey, G. G. Binder, Jr., and A. L. Draper, Carter Oil Co.

"Deterioration of Miscible Zones as Applied to Recovery Processes," J. A. Sievert, J. N. Dew, and F. R. Conley, Continental Oil Co.

"Secondary Recovery by Butane Injection in San Pedro Pool of Northern Peru," Robert Moscrip III, International Petroleum Co.

Logging, Statler Hilton

"Streaming Potential and SP Log," M. Gondouin and C. Scala, Schlumberger Well Surveying Corp.

"Departure Curves for Self Potential Log," A. E. Worthington and R. F. Meldau, California Research Corp.

"Report on Displacement Logging," R. H. Winn, Halliburton Oil Well Cementing Co.

"Effects of Treating Agents on Electro-Chemical Activity of Drilling Mud Filtrates," L. B. Lipson and H. L. Overton, University of Houston.

"Density Logging in the Gulf Coast Area," J. L. P. Campbell and J. C. Wilson, Lane-Wells Co.

WEDNESDAY, OCTOBER 9

8:30 a.m.

Field Case History, Adolphus Hotel

"Review of Porter Field Unit Pressure

Maintenance Project, Karnes County, Texas," R. C. Randle and R. J. Swaim, Magnolia Petroleum Co.

"Report on Old Luling (Edwards Limestone) Field, Caldwell and Guadalupe Counties, Texas," Phillip Davis and O. N. Goode, Magnolia Petroleum Co.

"Comparison of Predicted to Actual Production History of Condensate Reservoir," J. K. Rodgers and N. H. Harrison, Gulf Research & Development Co., and S. Regier, Gulf Oil Corp.

"Analysis of Predicted vs. Actual Gas Injection Performance of Williams Field Reservoir, Coleman County, Texas," E. E. Runyan, Sohio Petroleum Co.

Modified Gas Drive Processes, Baker Hotel

"Laboratory Evaluation of Prospective Enriched Gas Drive Projects," D. M. Kehn, G. T. Pyndus and M. H. Gaskell, Humble Oil & Refining Co.

"Improving Miscible Displacement by Gas-Water Injection," B. H. Caudle and A. B. Dyes, Atlantic Refining Co.

"Miscible Displacements of Reservoir Oil Using Flue Gas," H. A. Koch, Jr., and C. W. Hutchinson, Jr., Atlantic Refining Co.

"Fluid Dynamics During Underground Combustion Process," L. A. Wilson, R. J. Wygal, D. W. Reed, R. L. Gergins, and J. H. Henderson, Gulf Research & Development Co.

"Process Variables of In-Situ Combustion," W. L. Martin, J. D. Alexander, and J. N. Dew, Continental Oil Co.

Well Completion and Stimulation, Statler Hilton

"Pressure Measurements During Formation Fracturing Operations," J. K. Godbey and H. D. Hodges, Magnolia Petroleum Co.

"Hydraulic Fracturing: Fracture Flow Capacity vs. Well Productivity," H. K. van Poolen, J. M. Tinsley, and C. D. Saunders, Halliburton Oil Well Cementing Co.

"Factors Affecting the Rate of Deposition of Cement in Unfractured Perforations During Squeeze-Cementing Operations," G. W. Binkley, R. E. Collins, and G. K. Dumbauld, Humble Oil & Refining Co.

"New Approach to Elimination of Slug in Shaped Charge Perforating," J. Delacour, Societe de Prospection Electrique; M. P. Lebourg and W. T. Bell, Schlumberger Well Surveying Corp.

"Properties of Cementing Compositions at Elevated Temperatures and Pressures," Greg Carter and Dwight Smith, Halliburton Oil Well Cementing Co.

"Developments in Well Completion Techniques," R. W. Coburn, Champlin Oil & Refining Co.

1:30 p.m.

Core Analysis, Adolphus Hotel

"Effective Compressibility of Reservoir Rock and Its Effects on Permeability," A. S. McLatchie and R. A. Hemstock, Imperial Oil, Ltd.

"Reservoir Rock Wettability—Its Significance and Evaluation," C. C. Mattax, M. O. Denekas, and J. E. Bobek, Carter Oil Co.

"Determination of Wettability of Oilfield Cores by Dye Adsorption," O. C. Holbrook and G. G. Bernard, Pure Oil Co.

"Effect of Laboratory Core Cleaning on Water-Oil Relative Permeability," H. Y. Jennings, Jr., California Research Corp.

Modified Gas Drive, Baker Hotel

"Analysis of Displacement of Oil by Gas-Driven Solvent," E. F. Johnson and H. J. Welge, Carter Oil Co.

"Performance of the Pickton Field," J. G. Calvert, Humble Oil & Refining Co.

"Petroleum Vaporization Recovery of High-Pressure Gas Injection," C. L. Barney, Magnolia Petroleum Co.

Production Chemistry, Statler Hilton

"Salt Water Disposal," W. F. Ellison, Magnolia Petroleum Co.

"Interpretations of Chemical Water Analyses for Indentification of Complex Mixtures of Waters," J. C. McKinnell, Standard Oil Co. of California.

"Diagnosis of Bacterial Sulfide Problems in Secondary Recovery and Salt Water Disposal Water Injection Systems," B. H. Moore, Tretolite Co., Div., Petrolite Corp.

"Copper Ion Displacement Test for Screening Corrosion Inhibitors," W. B. Hughes, Tretolite Co., Div., Petrolite Corp.

N.G.A.A. Rocky Mountain Meeting

BILLINGS, Mont. — The annual Rocky Mountain regional meeting of the Natural Gasoline Association of America will be held here September 25 at the Northern Hotel. A special program has been prepared featuring subjects of prime importance to Rocky Mountain areas and western Canada.

9:30 a.m.

Chairman: J. B. Taylor, Signal Oil & Gas Co., Los Angeles.

Opening remarks: N.G.A.A. President George T. Tennison, Shell Oil Co., Houston.

"Gas Conservation Plant Operation in Western Canada," by George McPherson, Imperial Oil, Ltd., Calgary, Alta.

"Handling Sour Gas Production in Wyoming," by R. S. Birmingham, Pure Oil Co., Worland, Wyo.

"Gas Products Plants in the Julesburg Basin," by George A. Wilson, Continental Oil Co., Denver.

2 p.m.

Chairman: Albert Taylor, Amerada Petroleum Corp., Tulsa.

Address: "The Constitution of the United States," by Glenn E. Nielson, President, Husky Oil Co., Cody, Wyo.

"A Simplified Sulfur Plant," by G. M. Franklin, L. V. Kunkel, and M. Webb, Pan American Petroleum Corp. Presented by M. H. Rahmes, Process Engineering Group Leader, Pan American Petroleum Corp., Tulsa.

"Hazards of Housing Sour Gas Treating Equipment," by Jed Burnham, Stearns-Roger Manufacturing Co., Denver.

"What's a Silicone," documentary, color-sound movie by Dow-Corning Corp.

A.A.O.D.C. Annual Meeting in Tulsa

TULSA.—The seventeenth annual meeting of American Association of Oilwell Drilling Contractors will be held here October 13-15 at the Mayo Hotel.

Program details are:

Sunday, October 13

2 p.m.—Registration.

Monday, October 14

9:30 a.m.—Meetings of committees.

12:15 p.m.—Luncheon—Crystal Ballroom, Mayo Hotel.

2 p.m.—General Session — Pompeian Court, Mayo Hotel.

President's address, Jack H. Abernathy, Big Chief Drilling Co., Oklahoma City.

"The Supplier and the Contractor," Rainey Elliott, president, Jones & Laughlin Supply Division, Tulsa.

Tuesday, October 15

9:30 a.m.—General Session — Pompeian Court, Mayo Hotel.

Committee reports.

"Forecast of Activity in the Drilling Industry," John C. Casper, Economics Editor, The Oil and Gas Journal, Tulsa.

12:15 p.m.—Luncheon, Crystal Ballroom, Mayo Hotel.

2 p.m.—General Session — Pompeian Court, Mayo Hotel.

"Progress Report on the Weight/Speed vs. Penetration Study." Introduction: Elmer Decker, president, Martin-Decker Corp., Long Beach, Calif.

"Analysis of Effect of Rotary Speed," John E. Eckel, director of drilling research, Carter Oil Co., Tulsa.

"Analysis of Effect of Weight," Henry B. Woods, assistant director of research engineering, Hughes Tool Co., Houston.

"Progress Report of Air and Gas Drilling Study," M. M. Brantly, president, Brantly Drilling Co., Inc., Midland, Tex.

"Applications of the Magnetic Coupling and the Magnetic Particle Brake," E. A. Studer, chief engineer, Baylor Co., Inc., Houston.

6:00 p.m.—Cocktail Party, Courtesy A.A.O.D.C., Crystal Ballroom, Mayo Hotel

7:30 p.m.—Banquet—Cimarron Ballroom.

Address: Honorable Robert S. Kerr, United States Senate, Washington.

Attorneys to Hear Imports Discussion

WASHINGTON.—A government official, an independent producer, and a utility executive will discuss the oil import-control program this week before the natural-resources law committee of the Federal Bar Association.

The Government side of the problem will be presented by Capt. M. V. Carson, Jr., in his first public appearance since being named administrator of the program last month.

Jerome J. O'Brien, president of the Texas Independent Producers and Royalty Owners Association, and George Kinsman, vice president of the Florida Power & Light Co., will be the other members of the panel.

The discussion will be part of a program on energy resources which also will include a discussion of nuclear reactors for generation of electric energy and a film on the St. Lawrence development. The program was arranged by William R. Connole, member of the Federal Power Commission and chairman of the committee.

the OIL AND GAS JOURNAL

Annual Pipeline Report

- A look at current construction operations
- Advances in pipe and piping
- What's new in automation and remote control
- Latest techniques for stations
- Cutting costs with new methods, materials

STEEP, ROCKY grade is typical of sharp hills in Kentucky crossed by Texas Eastern.

Kentucky's Craggy Hills

New blasting technique called into play

One of the hottest spots of this big construction year is the "pipeline alley" through Tennessee and Kentucky, which gas trunk lines cross en route to northeastern markets. The looping project reported here is part of Texas Eastern's 1,000-mile, 30-in. construction program, largest in the industry. This particular job approaches pipelining at its toughest on land. It's representative of the high level of construction activity and the efficiency of a modern big-inch spread.

By Paul Reed and Gene Kinney
Journal Pipeline Editors

PIPE LAYING over the sharp, steep, rocky hills of Kentucky has proved to be a severe test of construction skill and management. Frequently during the past 13 years these deceptive hills have been a problem to contractors working on big-inch gas lines from the Gulf Coast and Southwest across this area.

But H. C. Price Co. is making steady progress through these same hills. The company's procedure shows what adequate preparation, equipment, organization, and experience can accomplish.

The Price organization took the authors to Spread No. 5 when it was working near Winchester, Ky. Operations were observed on the ground and from the air in the company's helicopter, which fills a vital role in transportation and parts supply in the inaccessible country where the spread is strung out for 21 miles.

Only from the air can the continuous series of abrupt, rocky hills be fully appreciated. How tough the going was the authors later discovered during the hours spent clinging to the steep dusty slopes watching men and machinery work steadily ahead. Merely standing there was te-

PIPE GANG makes 3,500 to 4,000-ft. per day in spite of terrain.

READY FOR TIE-IN is pipe at railroad crossing. Ditching and pipe-laying equipment was winched up hill.

Becoming "Pipeline Alley"

to carve ditch across limestone slopes

FIRING LINE makes final welds through corn field. Numerous corn and tobacco fields covered hillsides and narrow valleys.

dious, without having an exacting job to do.

Spread No. 5 is laying pipe on one of the six sections totaling 344 miles between Barton, Ala., and Wheelersburg, Ohio. This represents half of the 12 loops of the 667 miles of 30-in. which Texas Eastern Transmission Corp. is laying between Kosciusko, Miss., and Uniontown, Pa., to expand transmission capacity from Mexico, Texas, and Louisiana fields to northeastern markets.

The spread gets 3,500 to 4,000 ft. per day steadily over the big sawtooth ridges which are sharp at the top as well as on the slopes. The strategy seems to call for keeping shot-hole drilling, shooting, and trenching well ahead of the pipe gang. This assures that the business of adding pipe to the line is not impeded. The basis for this steady progress is the year-in and year-out permanent organization of five big-inch spreads with abundant heavy equipment.

Shooting techniques . . . An outstanding feature of the job is a new technique for safer blasting developed by the Price organization. This contributes to safeguarding Texas Eastern's live original line, laid in 1952, which is only 25 ft. from the ditch for the new loop. By a new delayed explosion method, the vibration is minimized and so is the throw of rock.

This innovation in pipelining is the extensive exploitation of "delays" or "connectors" in the Primacord connections for detonating dynamite. Three years ago Price began using delays only for specific spots on the Gulf Interstate Gas Co. line. This year the company is going further by pioneering large-scale application of delays for pipeline construction.

The method may be briefly described as placing a delay between groups of two to six holes. Thus the "down cords" for, say, four holes are tied with square knots into ¼-in. cord trunk line that runs to a delay. This is connected, on the other side, with the cord trunk line continuing to the next group of perhaps four holes. And so on for the length of the ditch to be shot at one time. Shots are often 500 to 600 ft. and some-

WAGON DRILLS punch holes for dynamite charges to blast ditch through rock; 25 per cent of the ditch had to be shot.

times 1,000 to 1,500 ft. Shot holes are 30 to 36 in. apart in parallel lines along the course of the ditch 42 to 48 in. wide.

Use of "delays" . . . A delay or connector is officially designated as a "Primacord connector." It is furnished in the form of a capsule containing the so-called delay element which is a compound that delays the action of the detonating waves carried through the Primacord. A cord is attached to each side of the delay. The waves continue through the Primacord to the next group of holes. Waves are interrupted for about 1/17,000 of a second at each delay.

A detonating wave travels through the Primacord at the rate of some 20,350 ft. per second. When shooting with delays the apparent retarding effect is so small that the shooting seems only slightly slower than usual—something like the rattle of a machine gun.

Primacord is a detonating fuse for modern blasting consisting of an explosive core contained in a waterproof textile covering. It functions practically instantly and increases the efficiency of the explosive charge. It is economical, lightweight, simple to handle, easy to hook up, and insensitive to stray electrical currents.

With the use of Primacord, only one blasting cap is needed for a series of shots set off at one time instead of a blasting cap at each hole required by the older method which is being largely supplanted.

Drilling, ditching . . . Shot holes are drilled with five H-frame wagon drills having two drills per frame. There are seven air compressors for both shot holes and the digging of tunnels at road crossings. Approximately 25 per cent of the ditch is shot in limestone rock.

Ditch is dug by two ditching machines and eight backhoes. The three draglines in the spread are behind the ditch gang. One is just ahead of the coating-and-wrapping machine, one is with the lowering-in gang, and one with the tie-in gang. The ditch in rock has 4 in. of dirt padding and 24 in. of cover. These, plus the diameter of the 30-in. pipe, mean that ditch depth is 58 in. In soil the cover is 30 in. and total depth about 60 in.

Three "high lifts" move dirt for padding—sometimes carrying it as far as 400 to 500 ft. Some dirt for padding is bought and must be moved as much as a mile.

. . . Hillsides. On the steepest slopes, ditching with backhoes is done from the bottom upward. The backhoe is pulled by a 1¼-in. wire line winched by a D8 tractor. Pipe already welded in sections is lowered from the top of the hill down the slope into position in the ditch for final tie-in.

. . . Road crossings. Highway regulations in Kentucky require that secondary as well as primary roads be bored or tunneled for pipeline crossings. Because of the prevalence of rock, much tunneling is done by air hammers. The cuttings are removed from the tunnel by little red toy

LITTLE RED WAGON hauls spoil from tunnel being dug by hand. Rock prevented machine boring.

"Radio-Rancher" wagons. This is one of the more tedious phases of the project. One railroad and highway crossing required 10 days to hand tunnel. The average crossing takes 3 days, however. The crew was able to machine-bore only one crossing on the entire spread.

Some rock shield is wrapped on pipe at road crossings. All pipe for road crossings is hydraulically pressure tested for 24 hours just before installation in casing, in accord with Texas Eastern policy.

Spacing of gangs, equipment . . . The brush and fence gang was 12 miles ahead of the ditch gang. There was 4 miles of ditch ahead of the pipe gang. The other gangs followed closely in usual order. Lowering in was keeping up with the dope gang.

Right-of-way was cut 62 to 75 ft. wide. The brush-and-fence gang had 31 men with four power saws. The cleanup crew had a rock rake dragged by a D7 dozer, two dump trucks, a high lift, dragline, and three large tractors. This equipment facilitates leaving the right-of-way in good condition.

PIPE IS PROTECTED by coal-tar enamel, glass, and kraft paper, being applied by dope gang.

Welding . . . There are 25 welders in the spread putting together the 30-in. by ⅜-in. electric-welded pipe. They are divided in this manner: pipe gang, 2 stringer-bead welders and 4 hot-pass welders; firing line, 11 bellhole welders; 3 utility gangs have 5 welders; valves and crossover work is done by 1 welder; and the lowering-in gang has 2 welders.

All welding generators are driven by diesels which furnish more economical and reliable power. Firing-line generators are 300-amp. machines (rather than 200 or 250-amp.) in accordance with modern practice on big spreads.

About 25 per cent of the welds are X-rayed although the contract calls for only 15 per cent.

The pipe is protected by coal-tar enamel, glass, and kraft paper. All pipe rests on skids and is lowered in. There is no cradling into the ditch behind the dope machine.

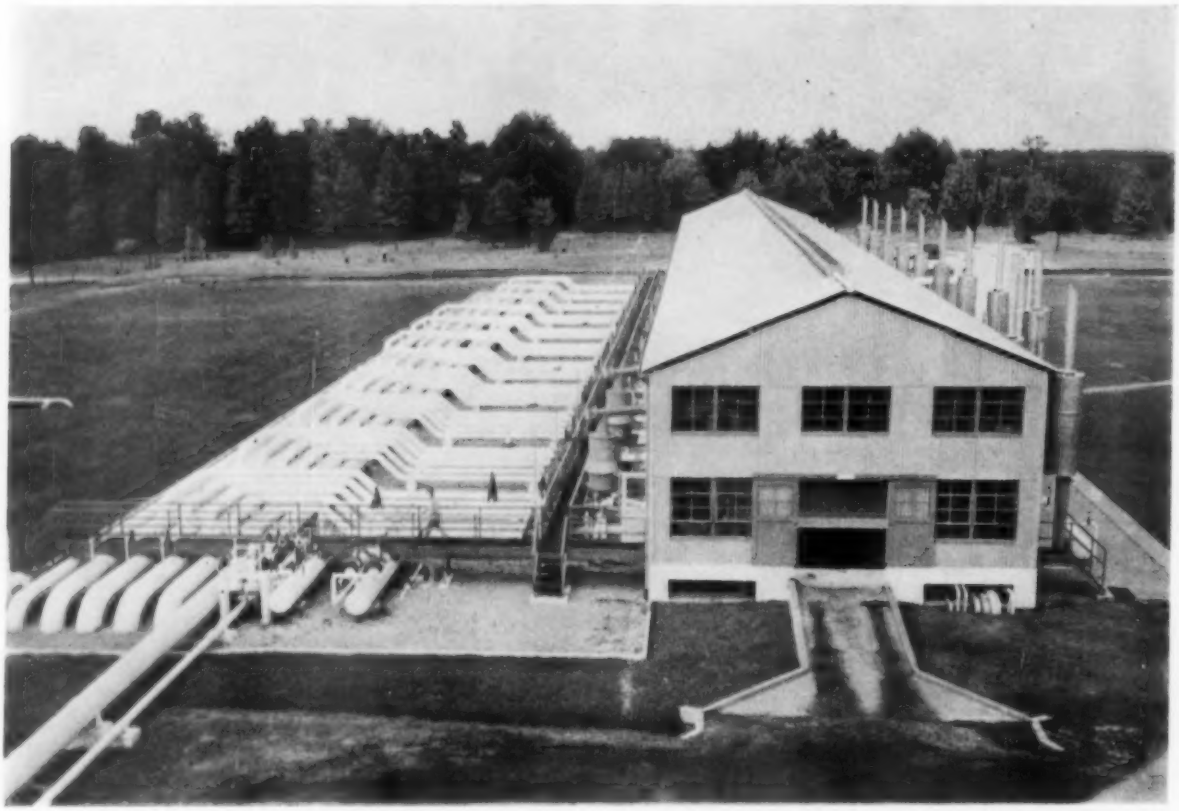
The authors were guided on the tour by H. C. Price, Sr.; Robert K. Shivel; W. H. (Blondie) Olrich; and Richard Hoyt.

PRIMACORD CONNECTOR or "delay" (circled) delays detonating waves to prevent simultaneous explosion of charges.

W. H. (Blondie) Olrich (left), spread superintendent, and H. C. Price, Sr., discuss job on right-of-way.

Spread is big . . . Investment of the contractor in the spread is $1,500,000. There is also considerable rented equipment. Upwards of $2,000,000 in equipment is tied up in the job. This large collection of equipment is accounted for by the amount of rock on the right-of-way and the steepness of the hills. The spread employs 360 to 370 men. The working day is mostly 10 hours.

A comparison of rates of progress shows that the Price Spread No. 5 is going ahead twice as fast as the spreads of other contractors laying pipe for the original line in the same section 5 years ago. This veteran spread, with the right equipment and plenty of big-inch experience in tough country, has made a difficult job routine. **End.**



PASTEL COLORS are the new look at the 22 compressor stations on the Texas Gas Transmission system. The 11,900-hp. Sharon, La., station is typical. Gleaming white replaces aluminum on outside piping. Green trim brightens gray exterior.

Fall pipelining "fashion" note . . .

ACCENT ON CO OR

By A. L. Roberts

Vice president, Texas Gas Transmission Corp.
Owensboro, Ky.

TEXAS Gas Transmission Corp. combines color compatibility with operating efficiency in the 22 compressor stations located along its 3,700-mile pipeline system. It was by design, not by accident, that the Texas Gas color code system came into being. Result is that all Texas Gas compressor stations are painted inside and out in pastel colors.

Studies show that there is no basic or compulsory reason why a compressor station should be painted solely in aluminum and gray, so we planned a painting program to provide more attractive work surroundings for employes and to make each compressor station an attractive addition to the community in which it is located.

Reaction has been enthusiastic. Employes and townspeople seem to be in agreement that industrial installations need not be a study in gray.

Field supervisors report a distinct reduction in apparent fatigue of station operators—especially those working night shifts—and basic psychology proved years ago that people work better in clean, appealing surroundings.

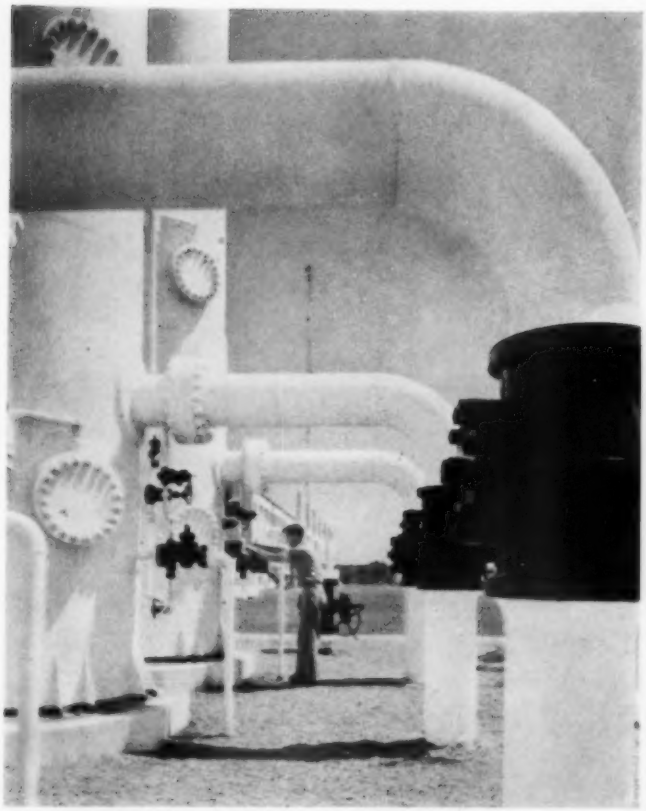
Cost factors . . . In the minds of operating people, the cost element must be ever present so it is interesting to note that this new paint program is no more expensive than our previous program.

Because of its proxmity to the Texas Gas general offices at Owensboro, Ky., the compressor station at Hardinsburg, Ky., was chosen as the site for the pilot operation in color selections. We had a general idea of the colors that should be used but hadn't decided exactly what co!or to use on the various pieces of equipment. Thus we tried various combinations until the most pleasing, as well as most utilitarian was found. We extended this pattern to all compressor stations as soon as painting was needed.

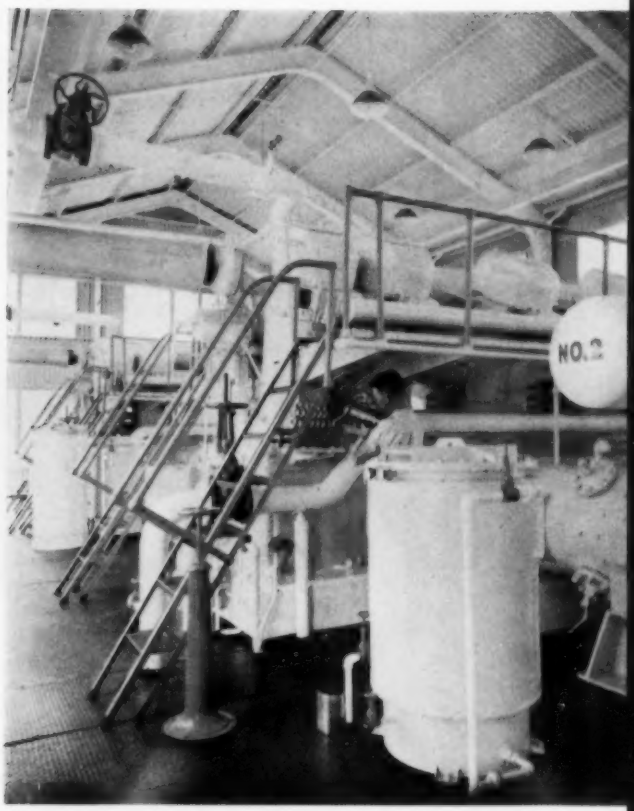
Color Coding

For station interiors, white became the color for the concrete engine blocks and main gas piping.

A color designated as "spotlight green" is applied to engine and aux-



WHITE scrubbers and piping are in foreground at Lake Cormorant, Miss., with 14,000-hp. station in the background.



CEILING at Sharon station is mist green, engine and auxiliaries are spotlight green.

iliary equipment, such as oil filters, unitized drive generator gear box and water pump, regulators above the engine room floor, panel boards and the like which are, in some way, connected to the engine. Dark green is used on engine handrails.

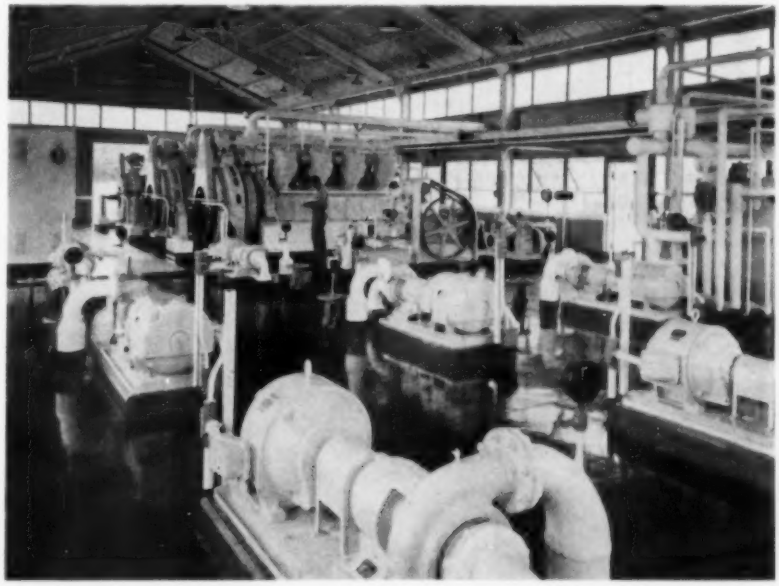
Cream enamel covers all piping—water, air and gas, except the main gas lines; bright green enamel proved to be best for all valves, whether high-pressure or low-pressure gas, water, lube oil, or air. Tile red, which matches the highly polished floor cover, is used as the base trim on piping equipment foundations to a height of 2 in. above the floor.

Hot exhaust lines, transite walls, and engine exhaust covers are the only things inside the buildings that retain the former gray hue. An aluminum silicone paint is used on the hot exhaust lines because of difficulty in retaining other paints on their surfaces, and a gray enamel is used on the transite and engine-exhaust covers.

Mist-green enamel is used on all steel and transite forming the ceilings; yellow enamel is used on all structural steel except that in the ceiling and on the crane travel carriage; and red enamel is used on the traveling crane beams and crank hooks.

Adding to the interior appearance of the buildings is the green enamel used on window sashes.

Outside colors . . . A touch of color is added to gray transite exterior walls by the application of a dark green enamel to windows, doors and door frames. All tanks, bottles and exterior piping are painted white. Aluminum paint is applied to exhaust mufflers, and a gray emanel to air cleaners and similar outside equipment.



TILE RED matching floor cover provides base trim for piping-equipment foundations. Interior of auxiliary building at Jeffersontown, Ky., 10,500-hp. station is shown.

LIGHTWEIGHT PIPE with a thin film coating FOR GATHERING LINES

By James N. Hunter, Jr.

IT IS NOW possible to realize savings in both investment and operating costs by using lightweight pipe with a modern thin-film coating on gathering lines. These will be important savings for the major pipeline company that normally lays 150 to 250 miles of gathering line every year. During 1952-55, 7,069 miles of new pipe was laid in gathering lines each year, according to the Bureau of Mines.

This volume market for lightweight mill-coated pipe should be sufficiently attractive to pipe and coating manufacturers to justify a change in their policy; it should enable them to make this product available to pipeline companies at a fair price.

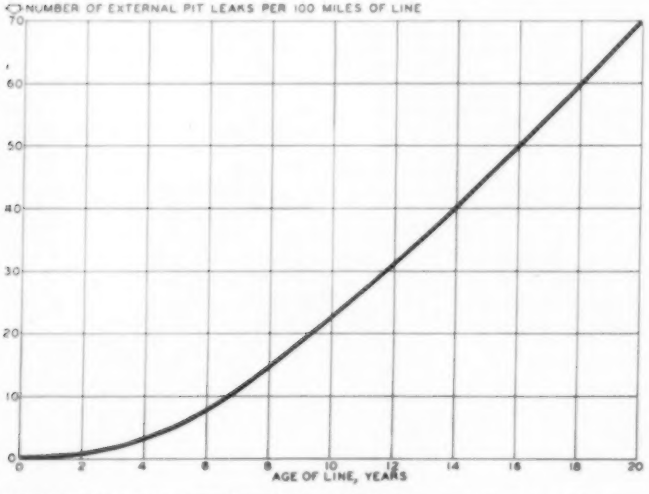
Trend to Thin-Wall Pipe

A trend toward the use of lightweight, thin-wall pipe in trunk pipelines began about 20 years ago. A major factor in establishing this trend was the realization that corrosion could be controlled more economically by properly applied bituminous coatings than by simply employing additional thickness in the pipe wall as a corrosion allowance.

Later, when cathodic protection had proved itself, the use of lightweight pipe with a good bituminous coating and cathodic protection became a universal practice on all but short-life lines. Normally the saving in steel was sufficient to cover the applied cost of the coating and cathodic protection, and the important saving came from reduced maintenance cost due to corrosion.

Pipe-mill reluctance . . . In 2, 3, and 4-in.-diameter lines, which are the popular sizes in a crude-oil gathering system, the practice of using lightweight pipe is not wide spread even though a number of operators coat small-diameter lines to control corrosion. This is a little difficult to understand when the operating pressures seldom warrant the use of standard-weight pipe; in fact, apparently more than half of all gathering systems are gravity operated.

In this period of rapidly increasing costs, keeping investment and maintenance cost in line is a real problem for every business man—the pipeliner included. He could make savings on both of these costs by applying the same approach to building and maintaining gathering lines that he has applied to building and maintaining trunk lines for so many years. The principal obstacle is the pipe mill which is reluctant to roll lightweight pipe because its capacity is geared to tonnage—not mileage.



CORROSION LEAK FREQUENCY plotted here is typical for 4-in. bare pipe. Fig. 1.

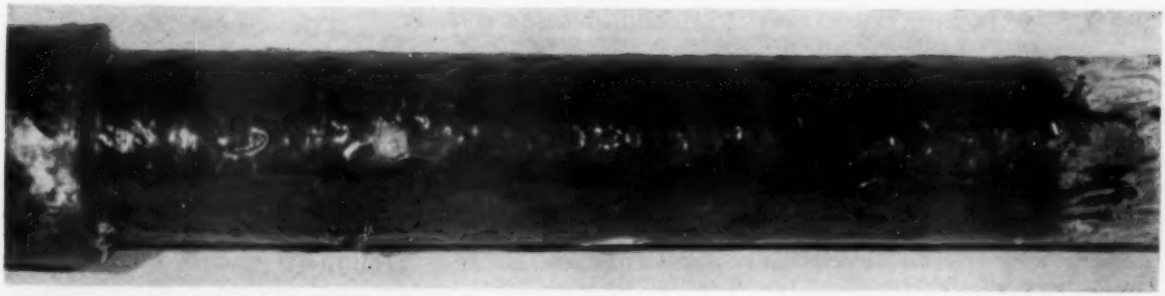
Prospective Savings

A corrosion-leak frequency, like that shown in Fig. 1, is not unusual for 4-in. standard-weight pipe which was laid bare. Using these data and a reasonable value for the cost of a corrosion-leak repair, it can be shown that coating lines like these when they are laid and placing them under cathodic protection would save money. The major item of line-maintenance cost is repairing corrosion damage. With that taken care of, the way is open to reduce investment by reducing pipe weight.

Theoretically, one could go down to that thickness which would hold the maximum operating pressure with a reasonable factor of safety. However, the price of pipe does not drop in direct proportion to wall thickness, so the choice of wall thickness boils down to what can be obtained at the right price.

Investment, maintenance . . . In a recent survey of pipe manufacturers, several were located who would roll 0.125-wall 4-in. made to A.P.I. Grade B specifications which call for a mill-test pressure of 1,200 psi. This is the lightweight pipe that was used in the comparison of costs to lay bare standard weight and coated lightweight 4-in. shown in Table 1. The laying costs of both were assumed to be the same. The freight rates are those from a point in eastern Ohio. The table shows that in the Mid-Continent area there will be an investment saving of 11.5 per cent or more than $1,000 a mile in laying lightweight coated 4-in.

Maintenance savings during the life of a line are a little more difficult to



EPOXY-COAL TAR holds up well after 10 months. . . .

A GOOD HOT-APPLIED BITUMEN has 1-in. disbonded area after 6½ months. Fig. 2.

PIPE AND PIPING

determine because these costs vary considerably from location to location and from time to time. The two values used in Table 1 represent a high and low in maintenance due to corrosion, and were chosen in this way to illustrate this method of comparison. This shows a minimum savings of $18 per mile per year and a maximum savings of $65 per mile per year.

Coatings, Coating Practices

In the average gathering system the length of a line varies from a few hundred feet to a mile. As a result, mill or yard application of coating is usually more attractive than using line-traveling equipment. The common practice is to have the pipe coated in carload quantities, ship it to a central location for storage, and withdraw from this storage as needed.

The most popular coatings for this purpose are hot-applied coal tars or asphalts with asbestos-felt or glass-fiber wrappers. As a group the bituminous coatings have a poor resistance to cold flow which makes racking for long periods inadvisable. In addition, considerable care is needed in handling and bending during the laying operation to avoid damage which requires patching. Recently, however, several coatings have reached the market which have physical properties far superior to those of hot-applied bituminous materials.

New coatings . . . For want of a better term "modern thin-film coating" will be used to describe this broad group of materials which are mostly synthetic resins of the thermosetting type. Laboratory tests and limited field tests show that, compared with the popular bituminous coatings, they have an equal or higher volume resistivity, and far superior resistance to impact and cold-flow damage. Of equal or possibly greater importance, some of the modern coatings have extremely good resistance to the migration of moisture between the coating film and pipe under cathodic protection.

As an example, Fig. 2 shows laboratory test nipples which had been cathodic by 3 volts in salt water. One was coated with a 15-mil epoxy-coal tar and the other was one of the better-performing hot bitumens. Deliberate punctures were made in both samples to simulate holidays. The largest disbonded area at a holiday on the modern coating measured about ¼ in. in diameter and that on the bitumen more than 1 in. in diameter.

EPOXY-COAL TAR-COATED pipe survives bend tests without checking, cracking, or disbonding. Fig. 3.

Performance . . . Fig. 3 shows two 20-ft. lengths of 4-in. pipe with the same modern coating which were bent

TABLE 1—ECONOMIC COMPARISON OF COATED LIGHTWEIGHT AND BARE STANDARD WEIGHT 4-IN. PIPE

	Dollars per foot	
Investment:	Bare 10.79 lb./ft.	Coated 5.84 lb./ft.
Pipe	0.8856	0.5495
Freight (to Drumright)	0.102	0.063
Coating		0.200
Miscellaneous	0.045	0.045
Right-of-way and damages	0.180	0.180
Engineering and inspection	0.045	0.045
Unload, haul, and string	0.049	0.027
Construction	0.320	0.320
Extras	0.100	0.100
Total	1.73	1.53

(Saving using lightweight pipe = 0.20 $/ft. or 1,056 $/mile)

	Dollars per mile per year	
Operating cost:	Bare 10.79 lb./ft.	Coated 5.84 lb./ft.
A. Case 1:		
Cathodic protection		3
Maintenance and cathodic protection		5
Repairs due to corrosion	196	
Depreciation at 5.5 per cent	502	444
Total	698	452
Income-tax saving at 50 per cent	123	
Total	575	452
Subtract depreciation	502	444
Total	73	8

(Saving using coated lightweight pipe = 65 $/mile/year)

B. Case 2:		
Cathodic protection		3
Maintenance of cathodic protection		5
Repairs due to corrosion	102	
Depreciation at 5.5 per cent	502	444
Total	604	452
Income-tax saving at 50 per cent	76	
Total	528	452
Subtract depreciation	502	444
Total	26	8

(Saving using coated lightweight pipe = 18 $/mile/year)

THE AUTHOR

James N. Hunter, Jr., is head of the corrosion section, engineering department, Service Pipe Line Co., Tulsa. He was graduated from University of Tulsa in 1943 with a B.S. in petroleum engineering. He has been engaged in corrosion-control work since joining Service in 1945 and is active in the N.A.C.E.

25° to 30° on a 10-ft. radius. One was bent when the pipe and atmospheric temperature were 75° F. and the other when they were 30° F. On a grit-blasted surface the modern coating did not check, crack, or disbond.

Similar properties have been reported for some of the thick vinyl and newer polyethylene coatings.

How to Cut Costs

The modern coatings are not without shortcomings though, and cost would appear to be one of these. Another is that carefully controlled conditions are required during the application to get a uniform film with the desired properties. Considering these shortcomings together suggests a possible answer to getting a good coating at the right price. And that is large-volume mill application.

"The modern coatings are not without shortcomings, though, and cost would appear to be one of these. Another is that carefully controlled conditions are required during the application to get a uniform film with the desired properties. Considering these shortcomings together suggests a possible answer . . . And that is large-volume mill application."

Today most of these coatings are sold in 5-gal. quantities through expensive jobber-distributor outlets. Several manufacturers have estimated that the cost of their product would be 30 or 40 per cent less in carload quantities.

Today the term "mill coating" means an operation that is performed at a plant which is usually located at an intermediate point between the origin and destination of the pipe. In this operation there is an unloading and reloading of the pipe that would not be necessary if the pipe were coated at the mill where it was fabricated. If this cost is eliminated, carload material costs are used, and consideration is given to savings inherent in a round-the-clock operation, the modern thin-film coating will cost no more than a hot-applied bitumen.

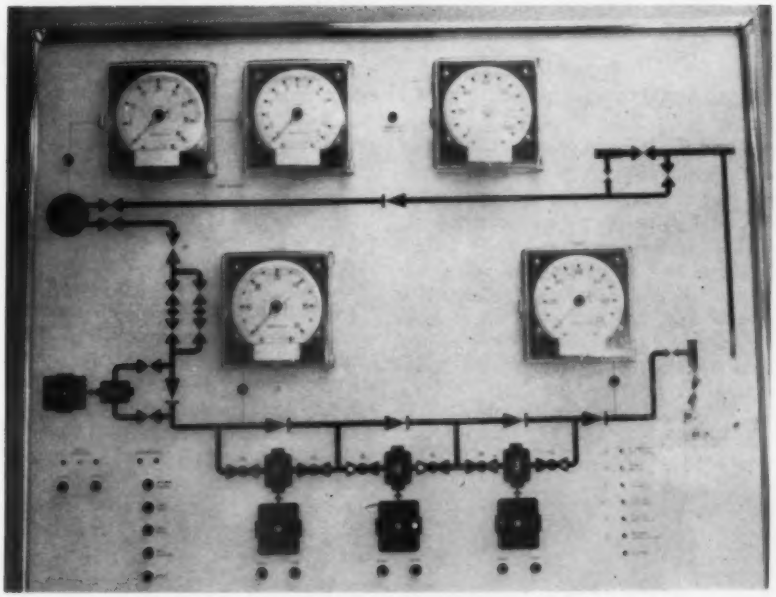
Recently a major pipe manufacturer began marketing a lightweight pipe which is suitable for gathering lines. Another manufacturer is now, or soon will be, marketing a special irrigation pipe which is coated where it is rolled; and still others are looking seriously at modern coatings which can be mill applied and stand rough handling. With these events, the concept of saving by using lightweight pipe with a modern thin-film coating became a reality.

At a wall thickness of 0.125-in. in 4-in., the theoretical minimum has still not been reached. However, it would appear that this may be the practical limit with today's welding and construction methods. The next step toward still lighter weight pipe may have to await the development of a suitable coupling and repair techniques which do not require welding.

NEW IBERIA station is pioneering remote control for Interstate Oil Pipe Line.

It's a "first" for Interstate

Station Converted to Remote Control



GRAPHIC PANEL shows layout of new unattended station. Fig. 1.

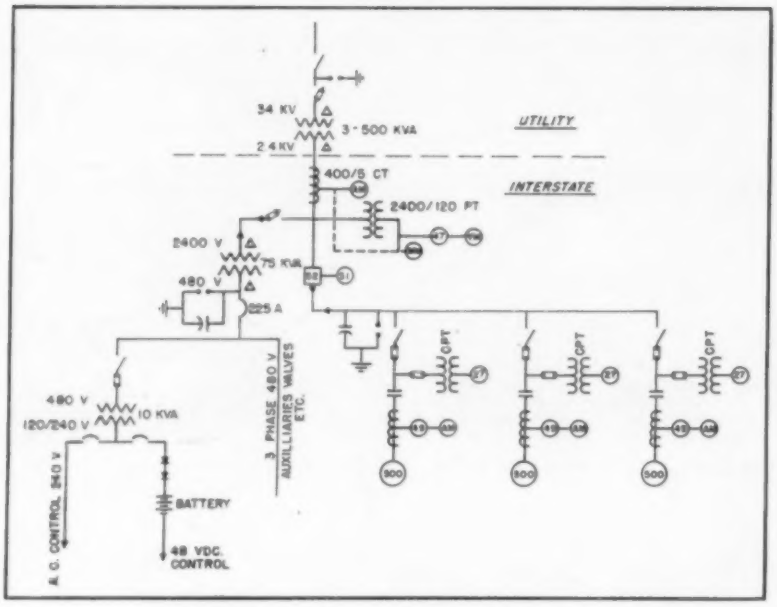
By E. A. Nelson
Interstate Oil Pipe Line Co.

IN JUNE 1957 the New Iberia station became the first unattended station under remote control on the Interstate Oil Pipe Line Co. system. Operation has been satisfactory, and the number of "bugs" has been remarkably few. This installation is expected to offer valuable operating experience with remote systems.

Economic studies had been made concerning this station in late 1955 and management approved the conversion to a remote-controlled unattended station with electric drive. At that time the station consisted of three 12-cylinder dual-fuel, high-speed engines driving three-stage centrifugals through speed increasers. An engine-driven one-stage vertical turbine pump served as the booster pump. Fig. 1 is a view of the graphic panel which shows the new station layout.

New Iberia station is located on Interstate's southwest system and functions as an over and short station with crude input coming from such fields as Jeanerette, Franklin, Bayou Sale, Duck Lake, and others. This crude in turn is pumped to the Anchorage terminal which is about 90 miles distant and near Baton Rouge. Downstream from New Iberia, the line consists of 12 and 16-in. pipe. Throughout the 90-mile line and at various points along the line, field injections are made by reciprocating pumps. This presents an operating problem because when these downstream units are injecting at a maximum, the line becomes well packed. As a result, New Iberia is cut back by virtue of the characteristics of the centrifugal pumps. In addition, the problem is made more difficult because there is a section of 12-in. lapweld pipe which begins about 15 miles from New Iberia with a pressure limitation of 710 psi.

These conditions made the problem of design more interesting because one of the objectives was to avoid the use of a throttling valve. The engine station had a very satisfactory arrangement for pressure control by governing the speed of the engines. This was accomplished by installing an impulse-duration telemetering system with the transmitter at the beginning of the 12-in. lapweld. The receiver-controller was located at New Iberia and it had an output air signal to the pneumatically operated engine-speed governors which was proportional to the signal from the trans-



34-KV. POWER LINE serves New Iberia station. Fig. 2.

mitter. Higher pressures caused correspondingly lower engine speeds.

Since the new station was to be operated with constant-speed electric motors, it was necessary to design the station to prevent excessive pressures on the 12-in. lapweld pipe by using the same telemetering system if possible. However, each pump was to have a different impeller diameter so that seven combinations were possible and the third unit was to have the largest impeller. The telemetering receiver was equipped with a high alarm contact which would close when the pressure at the downstream point would approach the 710-psi. limit. This contact is now used in the control circuit of the third unit so that it will prevent running the third unit when the set point is exceeded. The impellers in the other two units are both smaller, and when running simultaneously, are not able to raise the line pressure above the allowable value.

Power

New Iberia station is served by a 34-kv. power line which is shown on the one-line diagram on Fig. 2. The 1,500-kva. substation was provided by the power company to supply power at 2,400 volts. An oil circuit breaker, current transformers, potential transformers, and fused cutouts were installed in the substation and integrated with the power company's equipment. Fig. 3 shows a view of the substation with the high and low-voltage control on the left.

The power feeders from the oil circuit breaker are run to a high-voltage outdoor group of motor starters. The choice of the contactor type of control with high-voltage fuses for short-circuit protection instead of the mechanically latched air circuit breaker was made because the number of operations per day would be frequent. Unlike many stations where a single motor might be started and allowed to run continuously for a week or even a month, New Iberia motors will be exposed to daily starts and stops and it was therefore felt that the circuit breaker would be a misapplication.

The low-voltage power is obtained from a 75-kva. three-phase transformer which is shown in Fig. 2. The 480-volt secondary winding of the transformer is connected to a five-section outdoor motor-control center which contains a single-phase dry-type transformer, to supply 240-volt a.c. control voltage as well as power to the 48-volt battery charger.

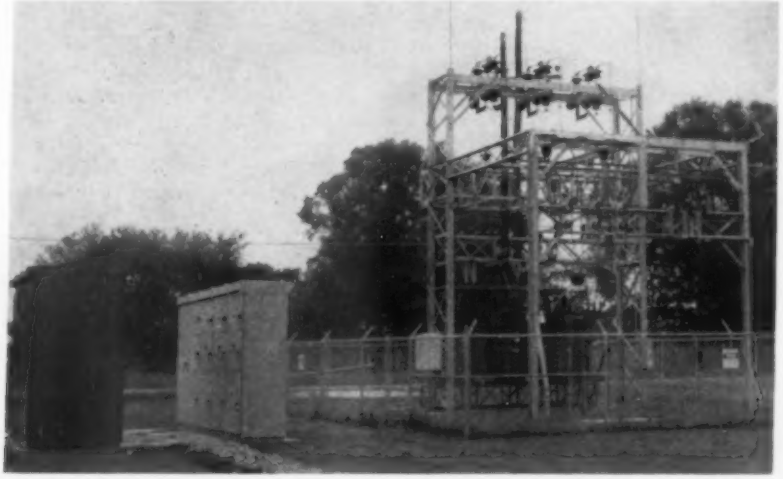
The motors for this station are of the weather-protected type with 500-watt space heaters and they are rated at 500 hp. continuous on a 50° C. temperature rise. The full-load speed is 3,560 r.p.m. The motors are connected for across-the-line starting so that when full 2,300 vo.ts is applied, smooth and rapid acceleration results.

Communication

The channel or connecting link between the master and remote station involved considerable attention because Interstate does not own the communication system. A teletype network between the various stations and full-period telephones between the district office and the Shreveport office provide the communications for operating the system in Arkansas, Louisiana, and Missisippi. It was therefore necessary to lease another channel to provide for the supervisory control and telemetering between New Iberia and Anchorage.

The channel requirements for the telemetering and supervisory were defined to the telephone company as a d.c. circuit with a 15-cycle rate. Accordingly, the telephone company offered a composite circuit to be operated with one side grounded. Actually this type of circuit is the type often used for impulse-duration telemetering and also for 60-speed teletype.

It would appear that such a circuit would be suitable for an all relay-type supervisory because the 60-speed circuit will permit a rate of about 22 cycles. Unfortunately, this is not the case, because the problem is not only a matter of pulse rate but also the pulse quality. The supervisory



SUBSTATION is provided by power company to supply power at 2,400 volts. High and low voltage control is at left. Fig. 3.

equipment purchased by Interstate operates on a series of eight impulses with a mark of 50 milliseconds and a space of 30 milliseconds. Each series of eight impulses has one or more long spaces of 120 milliseconds inserted in the series of eight so that it is possible to have as many as 128 combinations.

Since the system is essentially an on-off keying of the line with coded impulses characterized by long space locations, it is imperative that the channel be capable of passing the codes with minimum distortion. In order that Interstate could be assured of maximum reliability and negligible distortion, the telephone company was requested to provide a channel with low line capacitance since this is one of the usual causes of distortion with on-off keying. In other words, high line capacitance can cause the line relay which is the keying device to stay energized due to the charging effect of the high capacitance and distort the code.

The telephone company then offered a satisfactory channel which is a carrier telegraph employing the frequency shift principle. With this arrangement, an ungrounded 60-ma. loop is connected to the central office where the carrier telegraph sets are located. One characteristic of this equipment is noteworthy in that channel failure results in a continuous mark signal. The supervisory equipment is provided with an alarm for channel failure but the alarm is responsive to a continuous space signal. In order to detect carrier failure, a line supervision relay has been installed by the telephone company with a closed contact in series with the loop. Carrier failure results in an open loop which simulates a continuous space signal and therefore an alarm. A total of 30 points were used for control, indication, alarm, and telemetering.

Telemetering . . . Pulse-duration telemetering has been used on a selective basis to telemeter suction and discharge pressure, the pressure at the point 15 miles downstream from the station as well as the tank level. The existing 15-mile point pressure telemetering system has been modified so that the pressure can be read at the master station. This was done by inserting a repeating relay in series with the existing circuit such that its contacts would make and break with respect to time and in proportion to the pressure.

The contacts in turn are connected so that the supervisory line relay sends a signal to the master station where the receiver is located. This connection is so arranged that the reading is continuous except when the supervisory is being used for other functions or readings.

The tank-gage telemetering presented an interesting problem because it was desired to have the reading in feet and inches and eighths of an inch. The existing system was of the double selsyn type, and it was modified by removing the selsyn transmitter housing and adding two precision wound and linear potentiometers. These were connected to two electronic recorders of the a.c. resistance bridge, self-balancing type. Each recorder was provided with an attachment which would take the shaft position of the recorder and through a

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E. A. Nelson is an engineer in the electrical section of the engineering department for Interstate Oil Pipe Line Co., Shreveport. His work during the past 2 years has been concerned with remote station design including supervisory control, telemetering, and motor control.

Nelson graduated from Southern Methodist University in January 1949 with a B.S. in electrical engineering. Prior to coming to Interstate, he was employed by the California Co. for 3½ years as a construction engineer in the production department.

Here's how safety is achieved and how alarms are grouped

TABLE 1

1. **Station lockout, shutdown, and alarm functions:**
   - (a) Station overcurrent
   - (b) Battery undervoltage (second relay) (40 volts)
   - (c) Booster pump seal failure
2. **Station shutdown and alarm functions:**
   - (a) A.c. undervoltage and reverse phase
   - (b) High discharge pressure
   - (c) Low suction pressure
   - (d) High pressure at St. Martinville Junction (shut down No. 3 only if running)
3. **Station alarm functions:**
   - (a) Battery undervoltage (first relay) (44 volts)
   - (b) High main sump level
   - (c) Low pressure at St. Martinville Junction
4. **Unit lockout, shutdown, and alarm functions:**
   - (a) Motor thermal overload
   - (b) Motor inboard bearing overtemperature
   - (c) Motor outboard bearing overtemperature
   - (d) Pump inboard bearing overtemperature
   - (e) Pump outboard bearing overtemperature
   - (f) Seal failure
   - (g) Vibration
5. **Unit shutdown and alarm functions:**
   - (a) Incomplete starting sequence
   - (b) Low suction pressure
   - (c) High discharge pressure
   - (d) Pump case overtemperature

TABLE 2

1. **Station power:**
   - (a) A.c. undervoltage and reverse phase
   - (b) Station overcurrent
2. **Station hydraulic:**
   - (a) High station discharge pressure
   - (b) Low station suction pressure
   - (c) High main sump level
   - (d) Booster pump seal failure
3. **Electrical equipment:**
   - (a) Incomplete starting sequence timing relay
   - (b) Motor thermal overload
4. **Mechanical equipment**
   - (a) Motor inboard bearing overtemperature
   - (b) Motor outboard bearing overtemperature
   - (c) Pump inboard bearing overtemperature
   - (d) Pump outboard bearing overtemperature
   - (e) Pump case overtemperature
   - (f) Pump-seal failure
   - (g) Vibration
5. **Battery undervoltage**
6. **St. Martinville Junction pressure:**
   - (a) High pressure at St. Martinville Junction
   - (b) Low pressure at St. Martinville Junction

suitable linkage, position a cam for a pulse-duration transmitter.

Transmission problem solved . . . The problem of transmitting the two variables over a channel that permits a single transmission was solved by sending the foot reading first and storing it and then sending the inch reading. The operator at the master station presses one button to select tank gage and with the sequence as follows:

- The supervisory selects, checks, and connects the foot receiver.
- At the time that the foot gage is selected, a timer at the master station is energized which will automatically cause the supervisory to select, check, and connect the inch receiver at the end of 20 seconds. In addition, a timer at remote station is energized with contacts in the windings of the inch recorder balancing motor so that it will remain in a fixed position during the transmission of both readings. This "freezing" of the balancing motor was considered desirable to prevent possible ambiguity during high flow rates.
- After the inch receiver is positioned, the supervisory reset is operated and both receivers return to zero.

Local Protection and Alarms

The importance of proper channel selection in assuring maximum reliability for remote stations or any stations is shared by the proper selection and application of the protective devices at the station. Such items as low suction pressure, high discharge pressure, high bearing temperature, high pump-case temperature, seal failure, and vibration require special attention. Interstate's past experience has indicated a need for something that may not have a high absolute accuracy, but has high repeat accuracy. Therefore, the selection of the protection devices for New Iberia station gave rise to finding something better.

Temperature, pressure protection . . . The use of electronic tubes has been looked upon with disfavor but in recent years, industrial-type tubes and fail-safe circuitry have been developed. For this reason, it was decided to use resistance bulbs for temperature detection and bonded strain-gage cells for pressure transducers instead of directly actuated switches. Fig. 4 is a photograph of the cabinet which houses the amplifiers for the temperature and pressure-protection units. The recorders on the right are the tank gage. There are a number of desirable features with this system. For example, all of the 15 temperature units are identical and interchangeable with an adjustable range from 100° to 200° F.

In addition, the drawout construction permits ready removal for inspection and repair. Each temperature-protection unit is supplied with a set of resistances which form a bridge circuit with the resistance bulb as one of the sides. The first half of a dual triode amplifies the bridge unbalance while the second half acts as a phase-sensitive rectifier. The second half has a sensitive relay in its plate circuit such that it is energized under normal conditions. Its contacts in turn have a double-pole double-throw relay connected to the 48-volt d.c. supply. This is the power relay which keys the annunciator and other control circuits. Both relays are of the plug-in type.

It is apparent that a fail-safe arrangement of this type requires something to prevent releasing the power relay during temporary power outages. This is true because some of the devices such as bearing overtemperature protection are arranged to key a d.c. lockout relay which requires local and manual reset. This problem of unnecessary lockout has been solved by circuits which hold the power relays energized during an outage. Upon restoration of a.c. power, a timer is energized which will allow the tubes to warm up and then release the holding circuit.

The pressure-protection units are similar to the temperature units but the circuitry is modified for use with a bonded strain-gage pressure cell.

Lockout, shutdown, alarm . . . Table 1 is a list of the devices which cause station or unit lockout, shutdown, and alarm. Table 2 is a list of six alarm categories which show how the various alarms have been grouped. If the fault was the motor outboard bearing of the No. 2 unit, the supervisory would send a signal to the master station which would cause the de-energized red lamp opposite the mechanical equipment designation to start flashing. A bell will also sound. Pressing the reset buttons will silence the bell and change the flashing red lamp to steady red. In addition, the supervisory will send indication codes showing that the No. 2 unit is off the line by changing the running and stopped lamp indications. Restarting the unit from the master station would be impossible because the unit would be locked out.

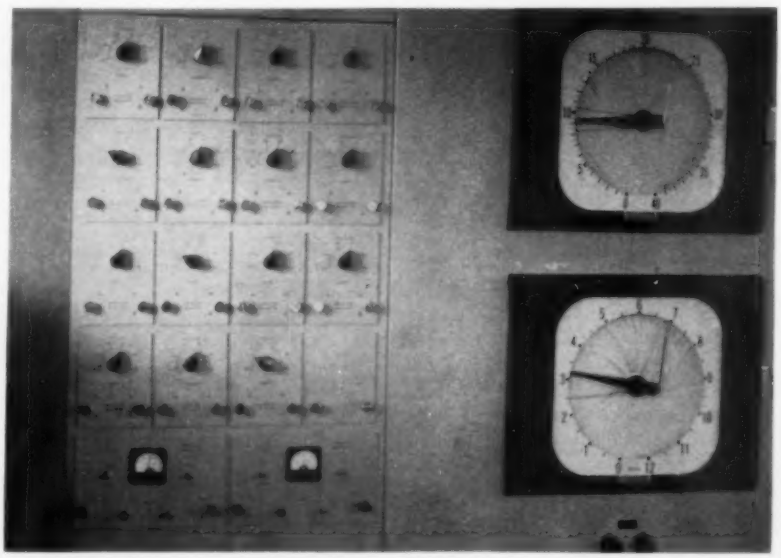
In order to make the unit available for service, it is necessary to visit the station. The annunciator is inspected and it will show the particular device which caused the alarm. After the trouble is corrected, the lockout relay is reset and the unit is available for service. The operator at the master station is notified of the availability because when the annunciator is reset, the alarm is cleared and a signal is set by the supervisory to inform the operator of the change.

References

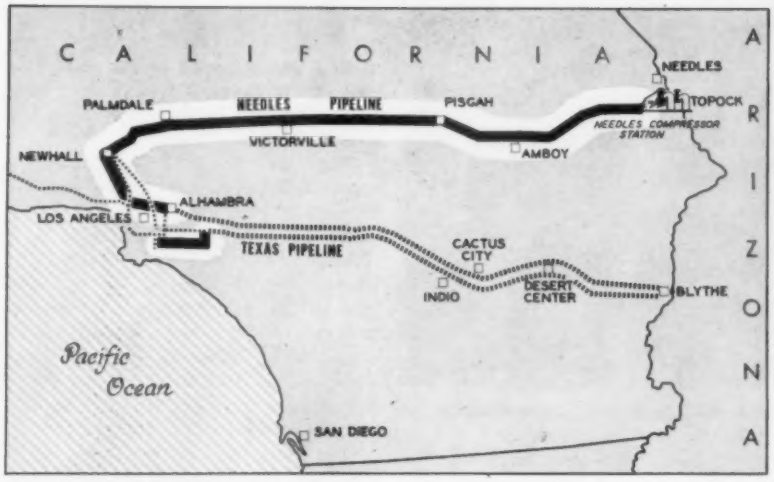
"Space Code Selector Supervisory System," by E. F. Forest and P. W. Schirmer, A.I.E.E. technical paper No. 49-272.

"Electronic Protective Devices for Pumping Units," by W. W. Holt, Jr., and Haskell Ginns, A.I.E.E. conference paper No. 57-39.

"Remote Controlled Unattended Pump Stations Utilized by Great Lakes Pipe Line Co.," by P. R. Madden and A. P. Rich, A.I.E.E. conference paper No. 56-457.



AMPLIFIERS for temperature and pressure-protection units are housed in this cabinet. Tank gages are at right. Fig. 4.



NEW NEEDLES-LOS ANGELES gas line of Southern California and Southern Counties gas companies provides shorter route for San Juan basin gas.

STRINGING TRUCKS are winched uphill in Mint Canyon area near Palmdale.

New Line Steps Up California Gas Supply

Here are the details of how construction was carried on at nearly a 2-mile-daily clip

By D. H. Stormont
District Editor

A NEW 30-in. pipeline, built by Southern California Gas Co. and Southern Counties Gas Co., has been completed between Needles, Calif., and Los Angeles to bring additional out-of-state gas to southern California.

Initially the 285-mile line will transport about 228,000 M.c.f. daily of San Juan basin and Permian basin gas after the Needles compressor station is completed this December.

Prior to the completion of the Needles line, the two California gas companies obtained all their out-of-state gas through two 30-in. lines to Blythe. There they connect to the Texas lines of El Paso Natural Gas Co. About 814,000 M.c.f. of gas daily is being moved through this line.

This carrier could have been looped and additional stations added to bring in additional gas. Construction of the Needles line was decided upon, however, for three reasons:

Future out-of-state gas supplies probably will be more readily available from the San Juan basin, the Four Corners area, and western Canada.

Such a northern pipeline would avoid concentration of southern California gas supplies in one system, which floods, earthquakes, and other emergencies might seriously disrupt.

The new line would bring needed supplies directly through rapidly growing communities in San Fernando and Antelope valleys.

New gas supply . . . The additional gas being purchased from El Paso Natural at the Topock, Ariz., terminus, just across the Colorado River from Needles, brings daily imports of the two gas companies to 955,000 M.c.f. El Paso has an application before the Federal Power Commission to supply an additional 75,000 M.c.f. to the two companies.

El Paso also has contracted to supply them an additional 200,000 M.c.f. daily of Canadian gas, which would be obtained from Pacific Northwest Pipeline Corp. If approved by Canadian, state, and federal authorities, one-half of this volume will be delivered starting in late 1959 and the remainder by September 1960.

Under terms of the agreement, El Paso will build a 500-mile, 34-in. line to connect with the Northwest carrier at a point near Twin Falls, Idaho. Southern terminus will be at the California line southwest of Las Vegas, Nev.

Completion rushed . . . Originally the new $33,500,000 line was scheduled for completion in 1958. Increased gas demand in southern California, plus a continued decline in the availability of gas from California fields, caused its construction to be speeded up.

First step for the northern route pipeline was the construction of a 49-mile section of 30-in. line from Alhambra northward to Newhall. This project was completed in the latter part of 1956.

Work on the 241-mile Needles-Newhall segment was started last January. Contract for the line was let to

STRINGER BEAD is applied by three welders on double-jointed 30-in. pipe, followed by . . .

HOT-PASS welders who reinforce stringer bead to prevent cracking. Next is . . .

coated and wrapped at the mill. For this job, however, it was shipped bare to distributing points and wrapped over the ditch.

Most of the 40-ft. joints were shipped to Kelso, 60 miles west of Needles. From there and the other principal railheads, Victorville and Yermo, pipe then was hauled to double-jointing yards set up at intervals of 20 miles. Because of mountainous terrain, 40-ft. lengths were strung along about 68 miles of right-of-way near Victorville. Some single lengths also were used through mountainous sections in the Mojave Desert.

The portable double-jointing yard operated on a scheduled output of 150 of the 80-ft. joints per day. The stringer bead and hot-pass weld were manually applied, with the pipe being rolled from one rack to another. The 80-ft. joints then were rolled onto storage racks from which they were fed into an automatic welding unit. There the filler and cap heads were applied by submerged-arc welding.

Ditching problems . . . The line mostly passes through desert and mountainous land in which there is little development. Excavation of hard rock was one of the major construction problems. In one 80-mile section through the Stoddard Mountains, 16 miles of hard rock were encountered. A mile-wide strip of lava was en-

R. H. Fulton & Co., Lubbock, Tex. The contractor performed the entire job, using only company-owned equipment.

One spread laid the 160-mile section between Needles and the Mojave River crossing near Victorville. About May 1 a second spread was put on the line, working westward from there to Newhall.

Before construction was started, the goal was to lay about 2 miles of line daily. The rugged terrain and dust storms slowed work to an average of about 8,000 ft. daily. Where the going was fairly good, however, the 2-mile goal was exceeded.

Pipe delivery . . . Pipe for the project was rolled by Consolidated Western Steel Division at its Provo, Utah, plant. Usual practices of California gas companies is to have the pipe

FIRING LINE working through lava flows from Pisgah crater east of Victorville.

countered in passing through the Pisgah crater east of Victorville.

In some sections the soil surface was found to be quite deceiving. Sandy soil which looked like it would be very easy going would be immediately underlain by hard caliche. On the other hand, some rocky soil which appeared difficult offered relatively easy going.

Where the right-of-way was rock, wagon drills carrying 3 to 14 drills were used. Backhoes were used to clean out the ditch after blasting. Most difficult drilling was through the eastern arm of the Pisgah lava flow, where solid obsidian had to be removed.

The western arm of the lava flow offered less difficulty because the rock was fractured. A ripper was used to cut this section of the ditch. As many as eight or nine tractors were used to pull the rooter.

Difficult going also was encountered in crossing the Ord Mountains near Barstow. Percussion drills pounded away for 5 weeks to prepare for blasting the ditch through the pass of solid rock.

Where rock didn't have to be drilled and blasted, the sand itself often caused trouble, particularly during windy days last May. Ditching crews had a hard time holding a firm ditch. One 9-mile section near Ludlow had to be backfilled, graded, and reditched. The wind and dust also curtailed welding operations.

BENDING MACHINE, of portable cable type, shapes pipe to contour of the ditch.

DITCH PADDER picks up dirt and rocks of less than 2-in. diameter with revolving screen and conveys padding to ditch.

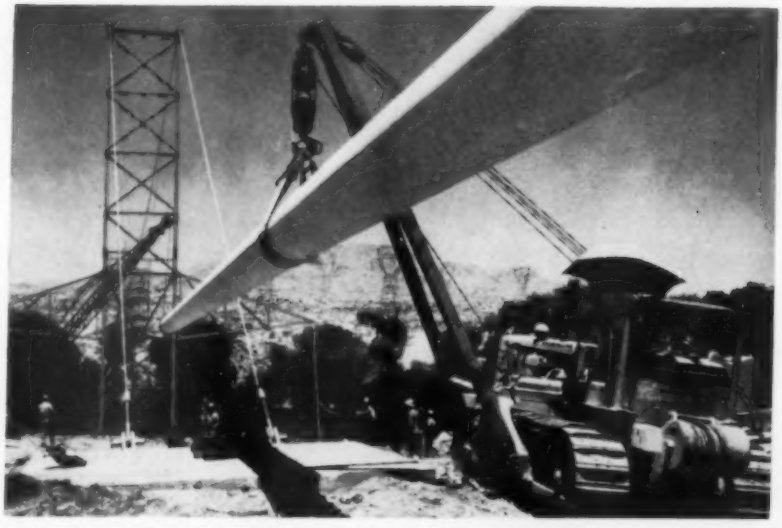
For most of the line a 5½-ft. ditch was cut, allowing a minimum of 3 ft. of cover. About 3 in. of padding and 8 in. of shading were used through rocky sections. All dirt for these uses had to be hauled to the right-of-way.

Welding, coating, testing . . . After the pipe was lined up, using mechanical lineup clamps, three or four welders applied the stringer bead. Teams of either two or three welders then applied the hot pass and final welds.

Pipe protection consisted of a prime coat, a second coating of coal-tar

COATED AND WRAPPED pipe is lowered into ditch near Palmdale.

MECHANICAL SHAKER screens out rocks larger than 2-in. Dirt is dumped into shaker by high-lift.



SUSPENSION BRIDGE will carry pipe across Mojave River, one of three streams spanned by bridges.

enamel, a glass-mat wrapping, and an outer wrap of 15-lb. asbestos felt. The lowering-in and back-filling crews closely followed the dope gang.

The line was tested in sections of about 12 miles. Water was used on the western section and where the line was close to populated areas. Hydrostatic pressure of 1,385 psi. were applied.

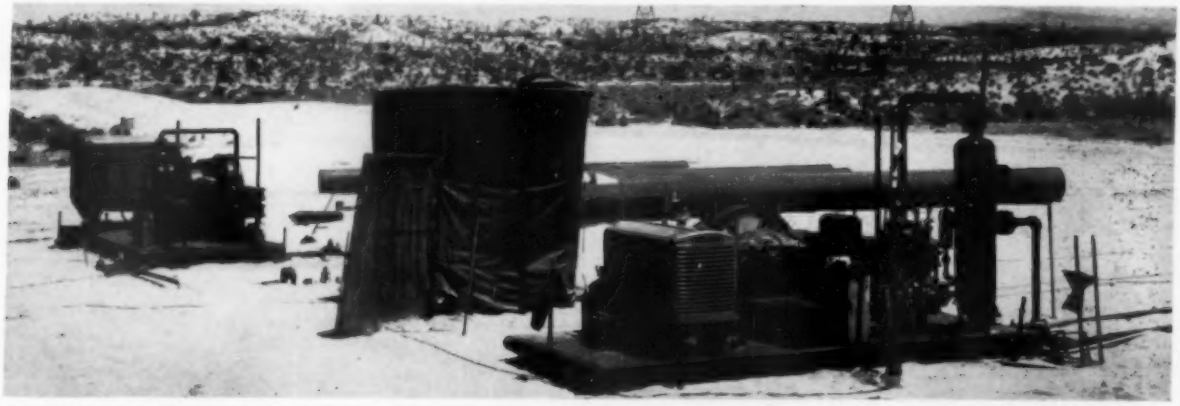
Most of the line, however, was tested with natural gas at 1,030 psi. Gas was obtained from El Paso Natural's Topock station. A portable compressor plant was used to boost the gas from 800 psi. to the 1,030-psi. test pressure.

River crossings . . . Three river crossings were built, all of the suspension-bridge type. Longest was a 900-ft. span over the Colorado River near Topock. The others were a 650-ft. span over the Santa Clara River near Newhall, and a 400-ft. span over the Mojave River north of Victorville.

The Colorado crossing was constructed, and will be operated, by El Paso Natural. Main structural-steel towers for this span are 90 ft. high, set on steel-reinforced concrete piers 50 ft. high. Primary components of the span are two main suspension cables of 2¼-in. strand. As at the other two bridges, supports were provided for a second line.

Compressor station . . . About 11 miles southeast of Needles, an 8,000-hp. compressor station is under construction, with an estimated completion date of December 15.

Initially four 2,000-hp. turbocharged Clark compressors will be used. Foundation is being provided for a fifth compressor, and long-range plans call for 10 units. **End.**



PORTABLE COMPRESSOR STATION boosted 830-psi. gas to 1,030-psi. test pressure. Gas was used for testing outside populated areas.

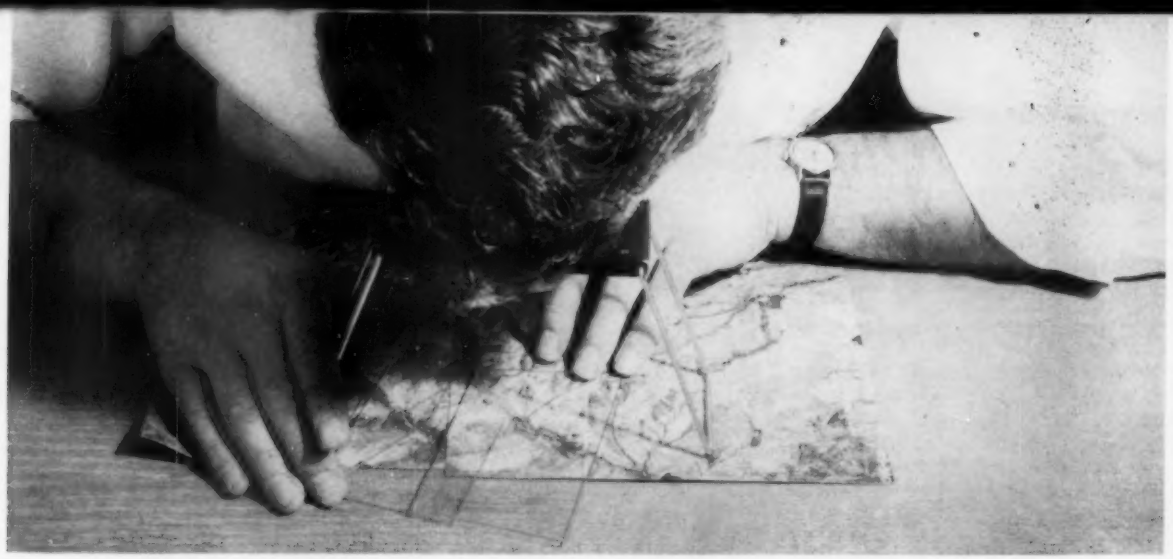


PHOTO INTERPRETER studies stereopair of vertical air photos with table-model pocket stereoscope. Fig. 1.

DESIGN-CONSTRUCTION

Are You Getting Full Value From Your Air Photos?

Properly interpreted, they can play a vital role in pipeline planning. Here are some tips on how to use this important tool!

By James G. Johnstone
Geophoto Services, Inc.

IN AERIAL mapping, stereoscopic inspection of air photos is vital for getting the most out of pipeline planning. This valuable modern technique is now widely regarded as an important step toward construction.

Most engineers connected with the development of new pipelines have probably used air photos to some extent. Air photography is beneficial even when confined to the preparation of topographic maps by photogrammetric procedures or the study of air-photo mosaics along the proposed line. Since these methods by themselves utilize only a fraction of the potential value of air photos, it appears from the standpoint of good engineering and good business that full advantage should be taken of the opportunities offered by stereoscopic examination.

Value of Air-Photo Surveys

Detailed study of the air photos by stereoscopic inspection makes it possible to anticipate many of the problems encountered in engineering a pipeline. It has been truly stated that contractors can generally overcome most construction obstacles if they are equipped with advance information. A stereoscopic air-photo study can do much to reveal adverse conditions in advance. Contractors are thus able to plan their equipment requirements and special procedures realistically.

A preliminary route survey of the proposed right-of-way by air-photo interpretation can be completed in a fraction of the time required to make a similar survey on the ground. Moreover, the information thus obtained is in many respects more complete than would be the ground survey. This is particularly true of rugged or inaccessible areas and where entrance is denied by suspicious and uncooperative landowners. The work of field crews is more productive because they can concentrate on problem areas indicated by the photo study.

The recent article by Frank A. Smith entitled, "Expediting Right-of Way" (OGJ, Feb. 2, 1957, p. 139) presented an excellent summary of some of the planning and location problems encountered in developing a pipeline right-of-way. Many of the problems he discusses could be eliminated or materially reduced by preparing a detailed pipeline-route survey through the use of air-photo interpretation. As an example he mentions the problem of relocation which arises after . . . "the ground survey might indicate terrain and economic features where it is impracticable to construct such as ravines, paralleling cut banks, side hills, common corners, railroad crossings, swamps and marshes."

While the above statement is certainly true, it is interesting to note that every factor mentioned can be observed and studied by stereoscopic air-photo interpretation without entering the field to discover its presence.

This would eliminate or at least considerably reduce the amount of such relocation work. Thus, the land department's efforts to secure easements and expedite other legal paper work could be facilitated.

What Air Photos Reveal

Consider briefly some of the types of information which such a study can produce and its significance to the engineering, construction, and maintenance of a pipeline.

Soil and rock types . . . Modern techniques of analysis and interpretation make it possible to delineate the boundaries of major soil and rock types on air photos. Moreover, the character of the soil and rock can be predicted within reasonable limits. In addition to types of rock, it is also possible to indicate gravel, sand, silt, and clay. This information has a number of important applications.

Changes in soil-profile character and material influence ditching techniques and the rate of advance. The study provides a realistic method of predicting rock - excavation situations including their location, type, and extent. The presence of adverse ground conditions such as bogs, marshes, and swamps can be readily established in advance. Thus, they can either be avoided or the contractor's work aided by advance planning.

One of the major untapped applications of such soil information is in the study of corrosion and its control. Except for such soil-terrain conditions as "coal blooms" and certain types of marsh or bog areas, corrosive characteristics of soils cannot generally be determined directly by air-photo interpretation. To reduce the amount of soil sampling and testing in the field, however, it is possible to delineate on the photos the soils whose type and character are similar and those which are dissimilar.

Although many soils are not corrosive in themselves, it has been found that galvanic currents are often set up when certain soils are connected by a conductor such as a pipeline. Information obtained from the air photos can be used to locate sites for testing the galavanic nature of adjacent soils types.

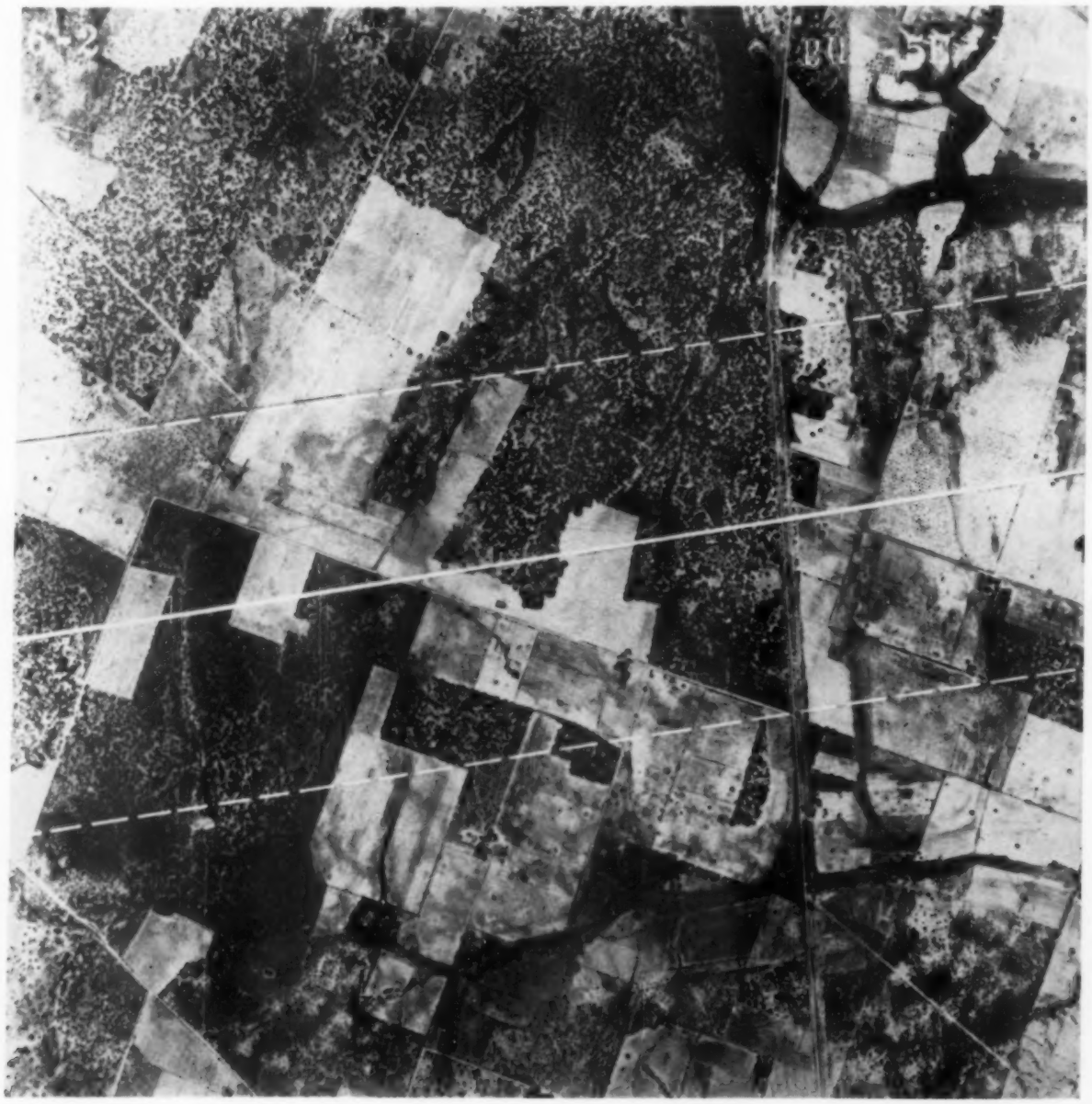
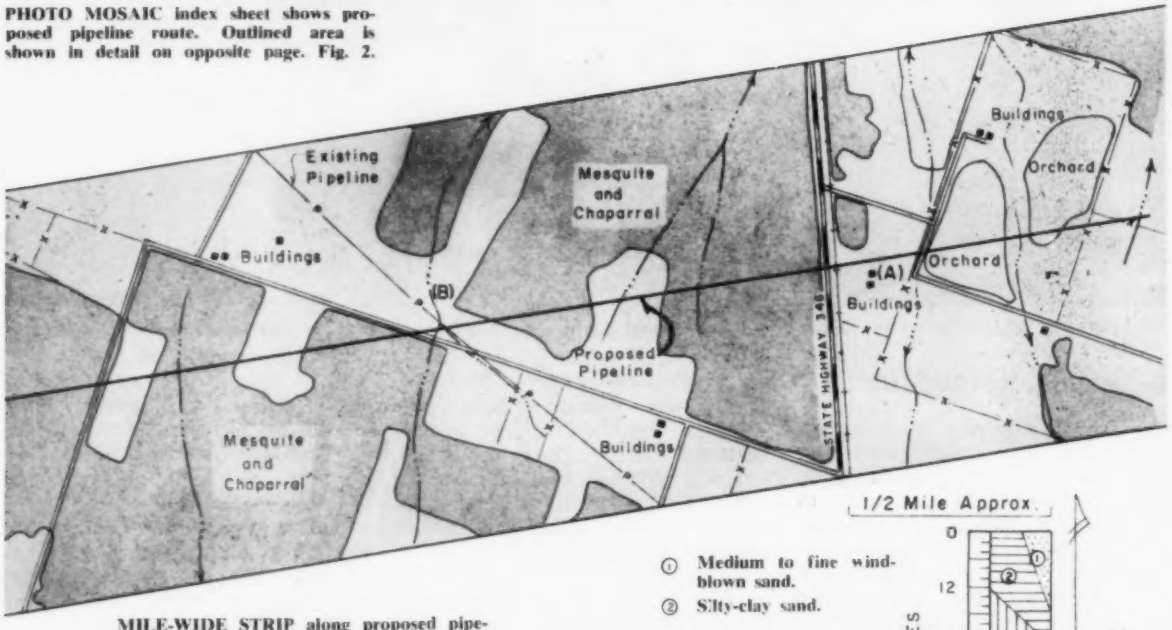
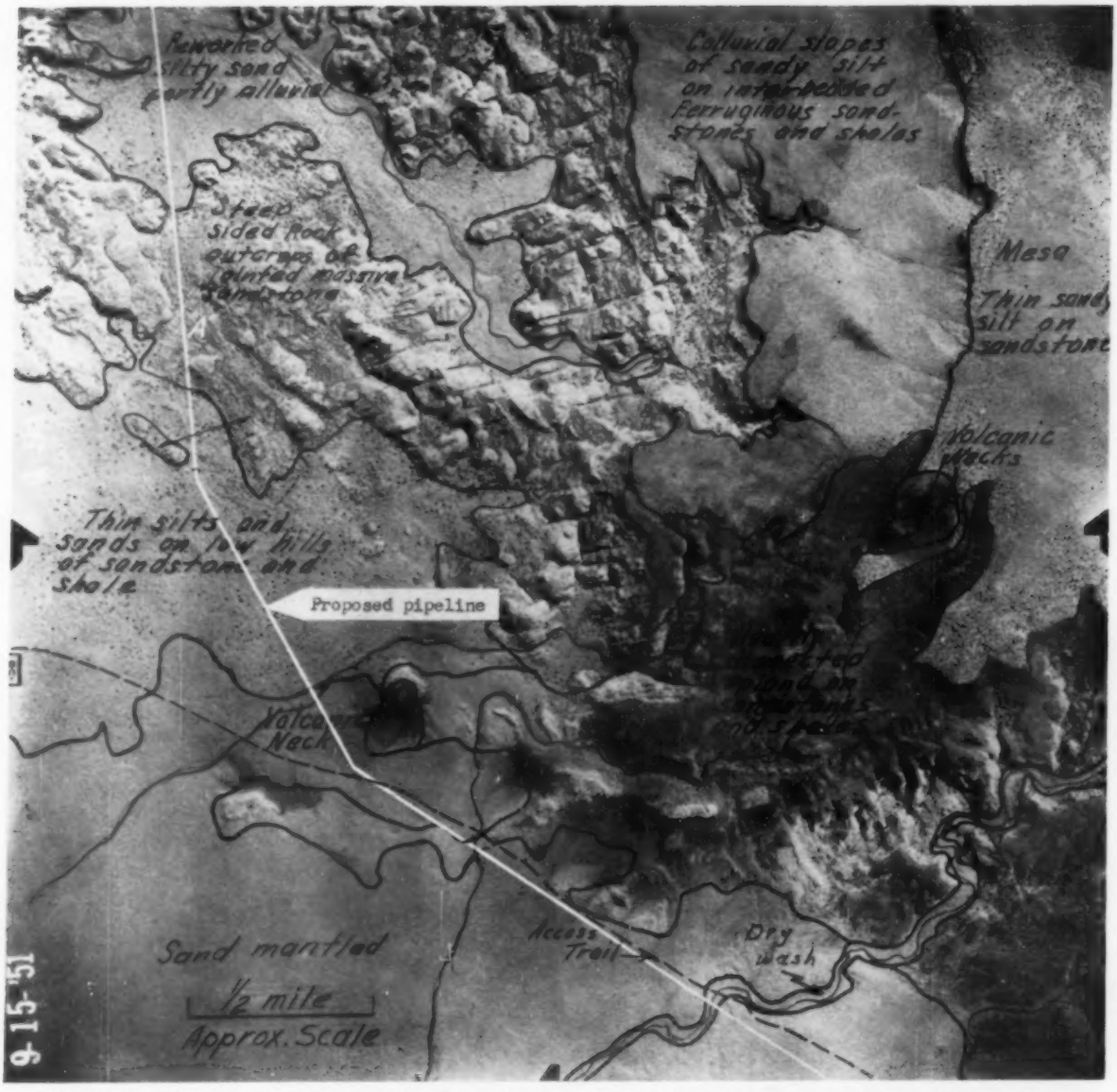


PHOTO MOSAIC index sheet shows proposed pipeline route. Outlined area is shown in detail on opposite page. Fig. 2.



MILE-WIDE STRIP along proposed pipeline right-of-way is shown on sketch map prepared from detailed stereoscopic study of the individual air photo on opposite page. Detail which it reveals would be impossible to detect on the mosaic. Fig. 3.



PIPELINE ROUTE SURVEY shows rugged and undeveloped terrain of Colorado Plateau in northeastern Arizona. Fig. 4.

DESIGN-CONSTRUCTION

Crossings, vegetation . . . A careful stereoscopic study of air photos can determine the number and extent of drainage crossings with a view to minimizing or facilitating such crossings. Erosion and deposition conditions such as drifting sand, sheet wash, excessive gullying, and potential landslide areas can be located and engineered accordingly. The type and amount of vegetation, especially tree cover, can be determined to prepare cutting estimates or to avoid heavy tree-covered areas entirely. The shapes, sizes, and special uses of fields are also readily determined by this type of study. These have great bearing in planning access for both inspection and repair.

Other cultural features such as road nets, railroads, canals, existing pipelines, and buildings can be readily annotated and evaluated. These factors are important because of intersection problems. The land man's paperwork and negotiations are expedited by the advance knowledge of these facts. Location of transportation facilities is also helpful in planning schedules for delivery of pipe, supplies, and construction equipment. All of these important considerations in planning the location, construction, and maintenance phases of pipeline projects can be developed in the office by air-photo interpretation without resorting to time-consuming and expensive field parties. Weather conditions do not interfere with the progress of this type of survey.

Photo mosaics are prepared from individual vertical air photos. Some mosaics are made by tearing and fitting portions of the individual pictures together in order to minimize the scale variations inherent in all photographs. In other cases, as in Fig. 2, the individual pictures are laid down in overlapping sequence as they were originally taken, and the assemblage is then rephotographed and reproduced, usually at a smaller scale than the original photography. Obviously much detail is lost in the process. If the mosaic is enlarged much definition is lost.

It is important to know that a mosaic exists, however, because it was made from individual contact prints. The detailed stereoscopic study of these prints is the pipeline-route-sur-

vey method being discussed.

Using a table-model stereoscope similar to that shown in Fig. 1, sequential air photos may be studied in much the same manner that pictures were viewed with the popular turn-off-the-century living-room stereoscopic viewer. That is, it is possible to study the photos in three dimensions or with a perception of depth. This adds immeasurably to the viewer's ability to study and interpret the photographs. These stereoscopes also magnify the picture to some degree, which helps to bring out detail. The air-photo interpreter is able to observe almost everything that a person on the ground would see and often much more.

Stereoscopic Interpretation

Some of the types of information which can be obtained by stereoscopic air-photo interpretation are illustrated by the example shown in Fig. 3.

The original photography shown here had an average scale of 1/20,000 (approximately 3 in. equal 1 mile). The mosaic (Fig. 2) had a scale of 1/60,000 (almost 1 in. equals 1 mile). The example represents a type of available photography that is suitable for general-purpose interpretation and lends itself readily to pipeline-route surveys. A large portion of the United States has been covered by photography of this scale and is available from government and commercial sources. The government photos cost 50 cents each.

The Department of Agriculture holds the largest 1/20,000 photo coverage. If special photography of the proposed route has been flown, it can be used to make the detailed study. While it will probably have been flown to a larger scale and will offer better results, it is not necessary to have special photography flown for this type of study. The smallest satisfactory scale, however, is about 1/20,000.

The photo mosaic shown in Fig. 2 includes the area studied in detail and shown in Fig. 3. By comparing the two it is evident that the degree of detail shown in Fig. 3 would be difficult or impossible to detect on the mosaic.

After the proposed pipeline location was placed on the photo mosiac, based on the usual considerations of point-to-point location, this line was transferred to the individual photograph across which the line falls. A strip approximately ½ mile wide was then marked off on each side of this line. This mile-wide strip was then studied in detail by stereoscopic examination of the photo and its overlapping "stereomates."

The items of information determined by this sample study include soil conditions, drainage crossings, type and amount of tree cover, and the consideration of special obstacles and intersections.

Soil conditions . . . Except for minor variations the soils to be expected along this strip are essentially of one type: a sand clay with some thin smears of wind-blown sand developed as a local topsoil. This information was determined by an interpretive process which requires an understanding of the fundamental principles of geology, physiography, and soil science. A detailed explanation of this technique is beyond the scope of this article. The gradients and cross-sections of the streams and gullies, together with other erosional, drainage, general terrain features, vegetation, and photo-tone factors were considered in detail.

By combining and comparing these factors with the several types of soil conditions known to prevail in this region (coastal plain of Texas), the soil-profile prediction was made. As shown in the legend, the general soil profile will probably consist of from 1 to 2 ft. of silty-clay sand overlying 2 to 4 ft. of sand clay. This material in turn should overlie an unconsolidated to slightly consolidated sand clay with caliche and seams of gypsum. Locally the upper part of this profile will have a smear of wind-blown sand up to 18 in. thick. Except for the sand-smear areas, trenches in this material will generally remain stable for some time after being excavated, due to the high clay content and generally low moisture content of the soil. Along this line there will be no problem of rock excavation and no bogs or marshes.

Drainage crossings, vegetation . . . Seven minor drainageways will be crossed. The proposed pipeline is located near the summit of a low irregular ridge which crosses the line several times. Thus the drainageways have limited watersheds. When coupled with the fair to good internal drainage of the soil and the generally flat terrain, it is predicted that these crossings will present no special problems.

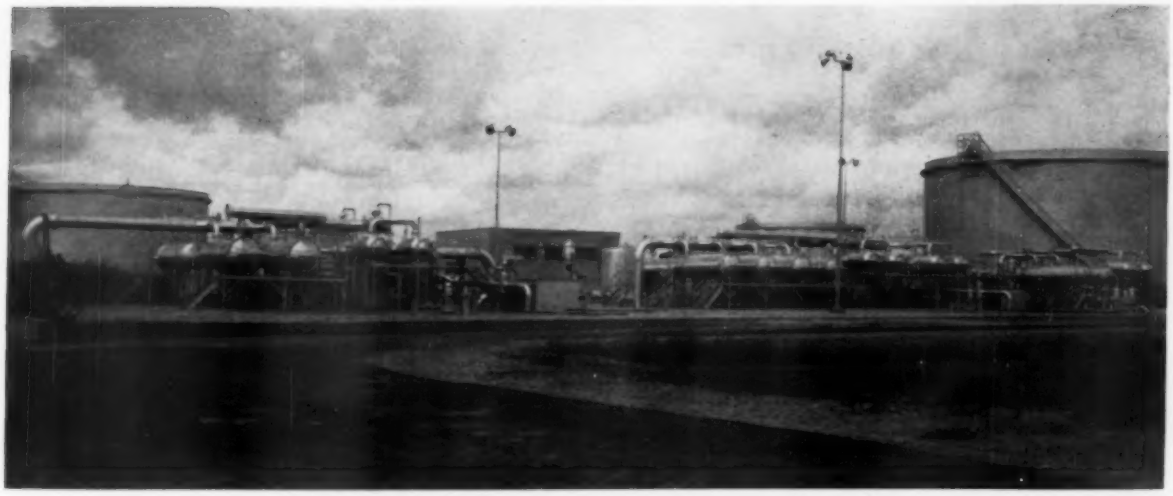
Using an average photo scale of 1/20,000, the line traversing the photo is about 14,275 ft. long. Of this, about 6,550 ft. or about 46 per cent lies on timber-covered ground. The timber cover consists essentially of mesquite and chaparral with some live oak. Tangled undergrowths are common. The rest of the route lies on cleared land in various stages of cultivation. Near the eastern edge of the illustration two small orchards must be crossed. The photographic study indicates, however, that these orchards have not been thriving very well, and they appear to be dying out. Cultivation is accomplished by irrigation systems which derive their water from local wells.

Within the area the line will cross an existing pipeline at "B." This intersection should be field checked inasmuch as one drainage ditch crosses here also. The line also crosses existing country roads three times. One crossing which will interrupt the orderly sequence of construction is the crossing of State Highway 346 and the parallel single-track railroad. All observable interpretation details seem to indicate that neither of these facilities carries a heavy volume of traffic. They offer good access for supplies and equipment. The closest approach to existing buildings will be at "A" where the line passes about 150 ft. north of a house and barn.

Another example of a portion of an air-photo-interpreted pipeline-route survey is shown in Fig. 4. This area is in a primitive part of the Colorado Plateau in northeastern Arizona. The example shows clearly the delineation of soil and rock boundaries along the proposed right-of-way. The method of direct-photo annotation is used in this example.

This example also points up the time and money-saving value of the method. The rugged nature of the terrain which the line traverses at "A" in the upper left-hand part of the photograph cannot be appreciated by viewing the flat print. Under the stereoscope it was brought into proper perspective. The most favorable location for crossing this topography was determined in a matter of minutes. Considerable time and effort would have been required to determine it by ground survey methods.

These examples of air-photo interpretation for pipeline planning illustrate the detail and variety of information which can be obtained by this method. In practice, successive overlapping photos along the route are studied and the information is then transferred to a strip map of the route. Such a map readily permits planning and estimating. It virtually eliminates the necessity for a similar type of study by conventional field methods. Problem areas can be spotted and given special attention in the field. Equipment can be programed in advance to speed construction, and problems of maintenance and access can be studied prior to construction.



PLANTATION'S FILTER SYSTEM at Baton Rouge input station. Fig. 1.

Products pipeline's filtering system features

Push-Button—or Hydraulic Control

Here's how Plantation changed over to a new program

By Ivy M. Parker

PLANTATION Pipe Line Co. made its first delivery in January 1942. At that time the system was composed of a main line (12-in. line from Baton Rouge, La., to Bremen, Ga., and a 10-in. line from that point to Greensboro, N. C.) and four lateral lines. During 1950-52 the system was expanded with an 18-in. line paralleling the 12-in. and a 14-in. line paralleling the 10-in. A second 18-in. line was laid between Baton Rouge and Helena, Ala., in 1956.

To accommodate the third pipeline without adding to the pump station and sheltered manifold area at Baton Rouge, it was necessary to relocate the filtering system outside of the regular operating area. This required a generally unattended system if the number of personnel was not to be materially increased.

All products, except jet fuel, are received into tankage at Baton Rouge. They are supplied by three outside carriers (Evangeline, Bayou, and Norco pipelines) and by four pipelines from a river pumping station. Products for the latter lines originate from a refinery at Baton Rouge and from river barges and tankers. Excess water is withdrawn from tankage after receipt of product. Sediment and some water present in tankage are picked up on tank entry because the suction pipe is located in a sump in the center of the tank.

Operating data showed that the filtering system for the three lines would have to remove 1,000 to 1,500 lb. of sediment per month and varying quantities of water. More water and sediment are picked up from gasoline storage than from fuel.

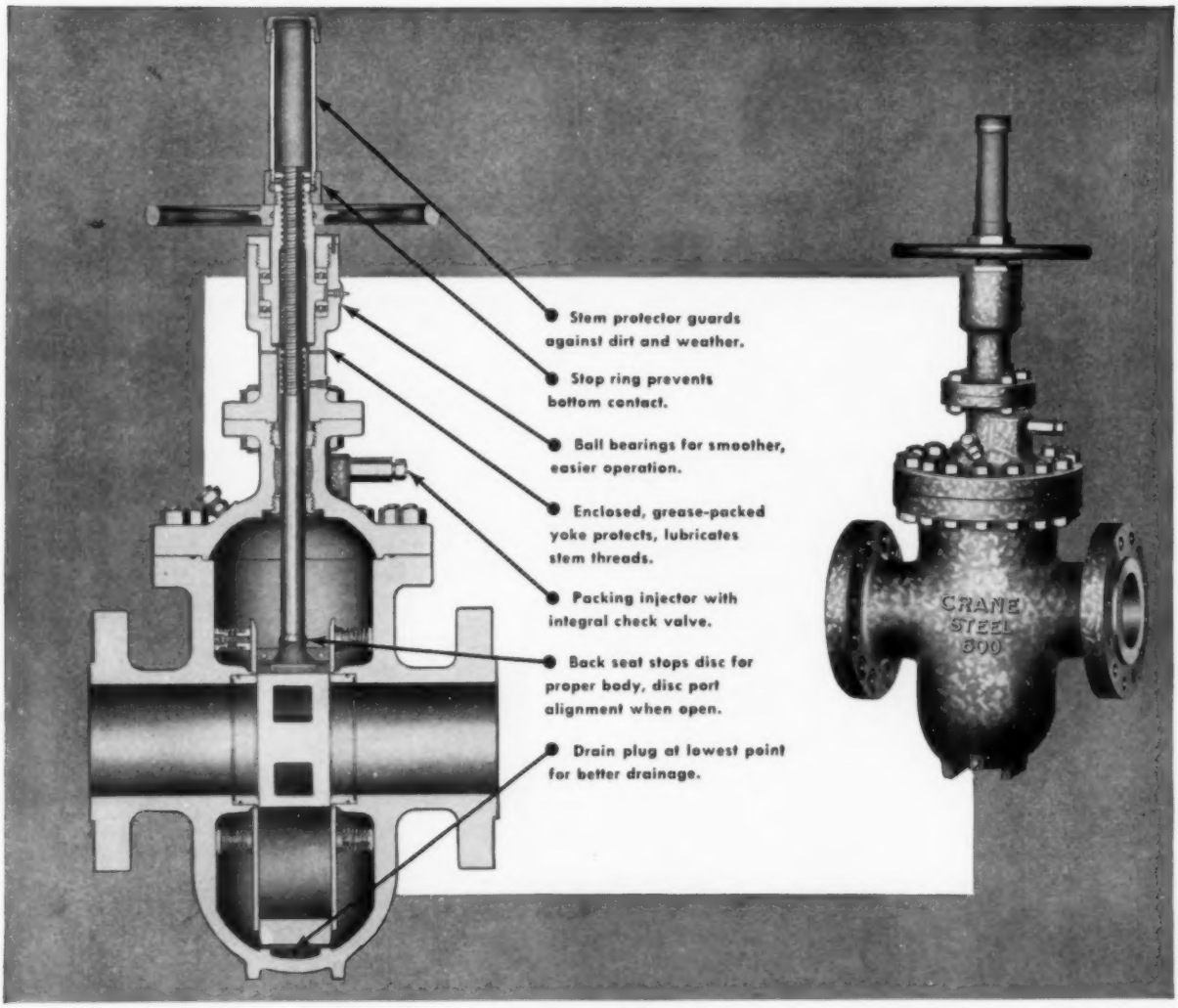
Filter System

The basic filter system consists of jet-cleaning strainers rated at 1,250 bbl. per hour, water separators rated at 1,400 bbl. per hour, and associated equipment. The strainers which are designed to clean automatically are hooked up in pairs to reduce the number of motorized valves and control equipment.

Fig. 2 is a schematic diagram showing one pair of strainers, two water separators, and associated equipment. As indicated, the product goes through the strainers where sediment is trapped, then to water separators where water is dumped to a gravity water-products separator, and then to meters. The water-products separator interface is maintained by a float-operated butterfly valve which closes when water level drops to a preset low point.

The product from this separator flows into the sump or repump tank and the water to a water-collection tank. The holdover tank receives product when the strainers are drained for cleaning and the product is immediately pumped back into the line. The flume collects water from the jet-cleaning operation. Each line has separate facilities except that water from all water-products separators collects in a single tank.

The control equipment is designed to cause the strainers to go through their cleaning operation when the differential pressure reaches a predetermined level. However, the operator has buttons on his control desk so that he can start or delay the cleaning cycle if it is desirable. For exam-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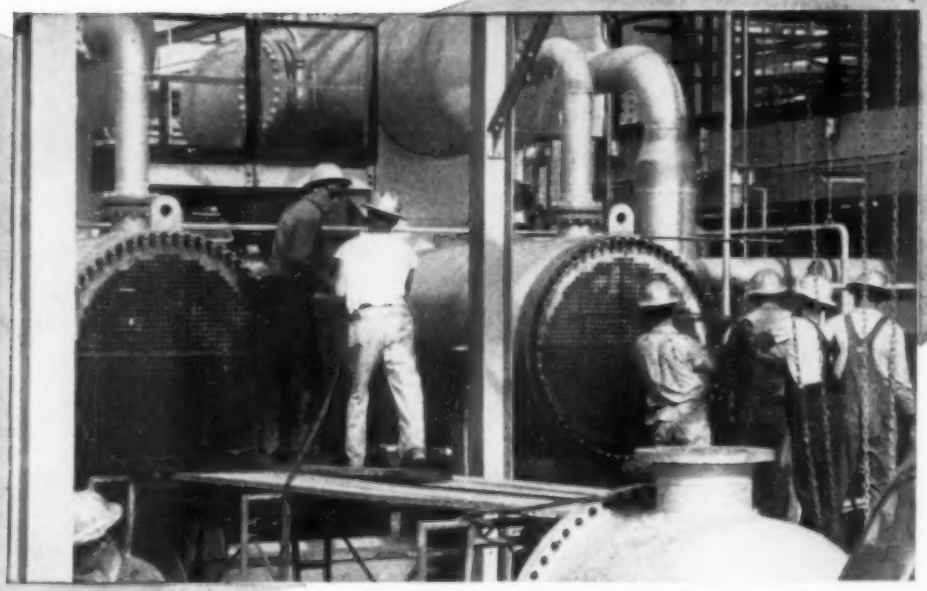

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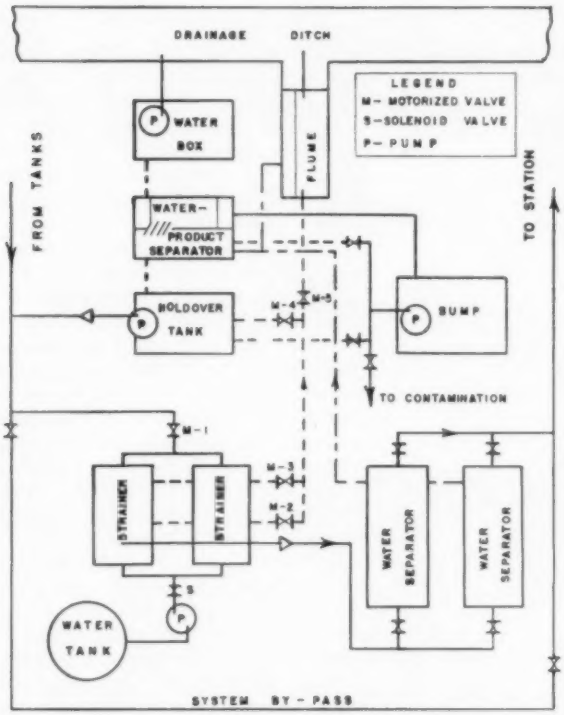


SCHEMATIC DIAGRAM of filter system. Fig. 2.

ple, the strainers are not allowed to go through a cleaning cycle during the switching of storage tanks.

Table 1 shows the throughput per line and the equipment provided.

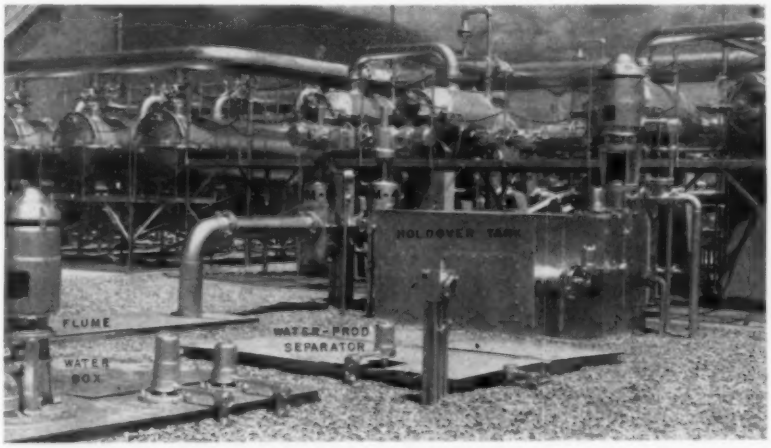
Fig. 1 shows an over-all view of the filter area which is located out in the tank farm. The 12-in. system is on the right, the 18-in.-B gasoline system is in the center, and the 18-in.-A fuel system is on the left. The building in the background houses the electrical equipment.

Fig. 3 shows the 18-in.-B filter bank as well as the auxiliary equipment: water-collection tank and pump, water-products separator, holdover tank, valves M-4 and M-5 which direct drain to holdover tank or flume, and water flume.

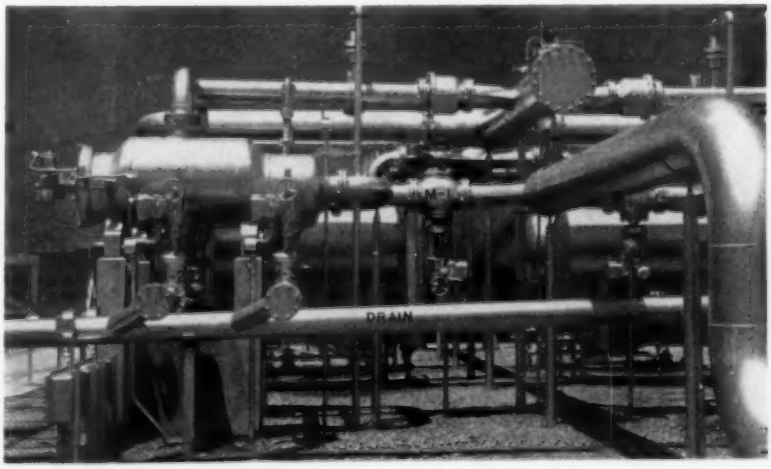
Design, Equipment Arrangement

Fig. 4 is a side view of the 18-in.-A strainers, which shows drain line, valve arrangement, and cleaning motor on one strainer. The water legs on water separators are visible in background. Connections are available for drain lines of two more banks of strainers when the throughput of the line is increased. Care was taken in the design of piping to provide rapid and efficient drainage. As shown in Fig. 4, the drain lines have a definite slope toward the holdover tank and flume. The strainers are mounted on 5-ft. concrete piers to insure adequate drainage from each section.

Each strainer contains an open-ended 24-in.-diameter by 5-ft.-long 200-mesh screen strainer basket which is sealed at each end with O-rings. The stream flows into the basket and



18-IN.-B GASOLINE filtering system. Fig. 3.



18-IN.-A STRAINERS, drain line, and water separators. Fig. 4.

THE AUTHOR

Ivy M. Parker, research engineer, Plantation Pipe Line Co., Atlanta, has been with the company since 1945. Her work is primarily concerned with internal corrosion and filtration. She received an A.B. degree from West Texas College, Canyon, Tex., and M.A. and Ph.D. degrees in organic chemistry from University of Texas.

Dr. Parker taught chemistry 1 year at Mary Hardin Baylor College, Belton, Tex., and 2 years at University of Houston. She spent 7 years at the Shell Oil Co. refinery at Houston and 2 years at the J. S. Abercrombie refinery (now Phillips) at Sweeny, Tex., dealing with corrosion and water-treating problems. Dr. Parker is active in the A.C.S., N.A.C.E., and the American Institute of Chemists.

then through to the outlet of the strainer. The cleaning mechanism consists of a small motor which rotates a jet arm supplied with water at 200 psi. to wash the sediment off the screen and down the drain.

Each strainer bank has a vent line with velocity check which opens when the inlet valve is closed for draining and closes when strainers are filled. It is essential that the strainers fill fairly slowly so that air can be bled off before putting them on the line. Therefore, the inlet valve partially opens for filling. When they are full, a float-operated switch causes the inlet valve to open completely.

The water separators contain excelsior coalescing medium and are provided with two sets of float-controlled automatic water dumps. One of these takes care of small quantities of water and the other takes over when a large quantity of water must be removed.

TABLE 1—THROUGHPUT AND FILTERING EQUIPMENT

Line	Products handled	Rate, bbl. per hour	No. jet strainers	No. water separators
12-in.	All	2,500	4	1
18-in.-B	Gasolines*	8,400	8	7
18-in.-A†	Fuels	2,500	4	4

*Handles some kerosine in winter months.
†This line to eventually handle 8,000 bbl. per hour.

Cleaning Sequence for Jet Strainers

1. A differential-pressure cell starts the cleaning cycle when the pressure drop across the strainer banks reaches a predetermined value or the operator pushes the proper button.

2. Inlet valve to bank No. 1 (two strainers in parallel) closes (M-1 on Figs. 2 and 4), taking this bank out of service. Outlet valve is a check valve.

3. The shell-drain valve (M-2) starts opening, draining the product through the screen. When it is completely opened, the body-drain valve (M-3) opens to complete drainage in shortest practical time.

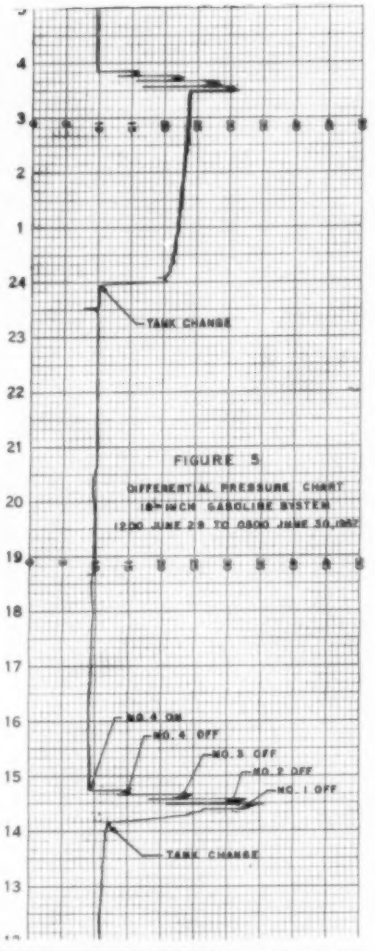
4. The flume valve (M-5) and the holdover-tank valve (M-4) switch to the flume open position. (The normal position between cycles is the holdover-tank valve in open position.)

5. The water pump and the jet-rotation motors on the strainers run for a preset time.

6. The drain valves close and the flume and holdover tank valves switch to the holdover tank open position.

7. The inlet valve opens partially, allowing the strainer bank to fill slowly.

8. The vent valve closes when the bank is filled



DIFFERENTIAL DROPS as clean strainers go back on line. Fig. 5.

9. The inlet valve opens completely and the bank is then back in service.

10. Each of the remaining banks of strainers on a single line then go through the same sequence of operations successively.

Sequence of Electrical Operations

1. System is activated by differential pressure cell or a switch.

2. Motor-operated inlet valve closes on bank No. 1, and when it is within its closed limits, a relay is activated.

3. This relay opens the shell drain valve that in turn activates a relay to open the body drain valve. A delay timer is used at this point to allow sufficient draining time.

4. The delay timer then activates the flume and holdover tank motorized valves to switch to the flume open position.

5. When switching is complete, water pump, jet-rotation motors, and a double-action timer are started. The timer shuts off the water-pump motor and the jet-rotation motor, allows drain time, and then closes the drain valves and switches the flume and holdover-tank valves to the holdover-tank open position.

6. When the drain valves close, they activate the inlet-valve motor, which opens partially, allowing the bank to be filled with product. When filled, the vent valve (velocity check) closes and a float switch actuates the inlet-valve motor to the full open position.

Operation has been very satisfactory. Certain modifications have had to be made in handling the drain and cleaning fluid. We anticipated that a complete separation could be obtained between the water and product. In actual operation, water was found in the drain piping which was being dumped into the holdover tank and then repumped to the line. A baffle was installed in this tank and a drain line was connected to the water-products separator so that water could be withdrawn. The water drain from the cleaning operation carried some product with it into the water flume. To correct this problem, a skimmer was installed along the side of the flume with a drain to the water-products separator.

Some difficulty has been experienced with sediment collecting in the bottom of the case of the body drain valve (M-3). See Figs. 2 and 4. This sediment may prevent the valve from closing completely and thus interrupt the electrical operation sequence. Arrangements are being made so that this sediment can be flushed out. When this is completed, it is felt that the system will be completely dependable for automatic operation.

The 18-in.-B system (gasoline) handles more sediment than the other two lines and has the least spare capacity. It requires approximately three cleaning cycles per day. Each system is operated with all strainers on the line. The cleaning differential is set low enough that it does not become excessive when a bank of strainers is removed for cleaning. The differential then drops as each bank of clean strainers goes on the line. See Fig. 5. Approximately 5 minutes are required for cleaning each pair of strainers.

The strainers protect the water separators from blinding so that their manual cleaning is scheduled at 2-month intervals.

The elimination of basket-type strainers in front of the meters has cut out a manual-labor cleaning operation of considerable magnitude. This has not adversely affected the product quality or the meter life. In fact, since the inhibitor is injected upstream of the meters in the present setup, the meter corrosion has been greatly reduced. **End.**

How Firm a Foundation . . .

Soil Mechanics Important in Marine Pipeline Construction

Unstable soil along the Gulf Coast poses a threat to pipelines. Some companies have experienced excessive vertical displacement involving newly completed lines. Two possible preventive measures: (1) During construction fill pipe with water, bury, and allow time for rehealing of soil before removing water. (2) Use heavier pipe and backfill.

By Robert J. Brown
Tennessee Gas Transmission Co.

IN GOING from dry land to marine pipelining on the Gulf Coast, operations become more complex. Complicating the problems peculiar to marine operations is the additional factor of unstable sedimentary soil deposited in recent geological times. These soil conditions are a potential hazard to the stabilization of pipelines.

Often companies with pipelines in these marsh and offshore areas have experienced examples of excessive vertical displacement, involving newly completed lines.

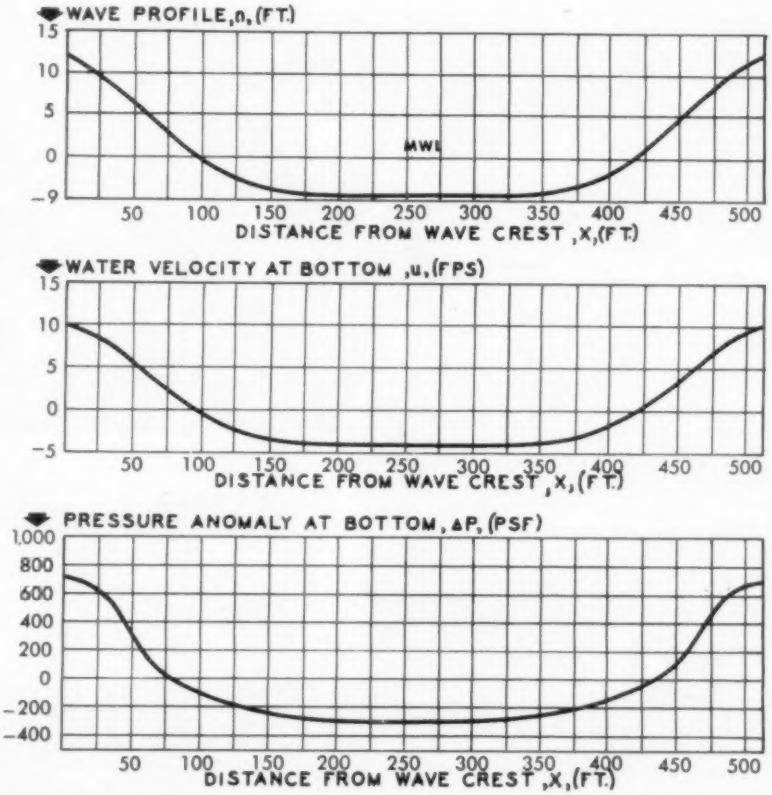
Damage by Hurricane Waves

In one case, hurricane waves acted upon a pipeline parallel to shore, within the breaker zone. The section about 3 miles in length and principally of sand, with an original bottom elevation of minus 3 ft. mean low gulf, had been subjected to a flotation ditch to minus 7 ft. mean low gulf and a pipe ditch to a minus 12 ft. mean low gulf. The line, when laid, had an elevation from a minus 8 to 9 ft. mean low gulf and was jetted to a minus 10 to 11 ft. mean low gulf 4 weeks prior to the hurricane.

After the storm, the pipe in the middle section had risen to the original ground level of minus 3 ft. mean low gulf exposing the uppermost surface of the pipe. Investigation provided the theory that exaggerated storm tides and wave agitation transported sand to the flotation ditch depositing it in a fluid state, specific gravity of about 2.0. The resulting buoyant forces on the pipe lifted it to the surface. Fortunately the span was long enough that the amount of deflection did not cause failure. One may assume that these tides were mostly perpendicular to the flotation ditch, causing vortexes in the ditch itself and allowing heavy particles of the transported sand to settle out.

Preventive measures . . . Two recommendations follow: (1) If during construction the pipe had been filled with water, jetted, backfilled, then time allowed for rehealing of the soil before removing the water the vertical displacement could have been eliminated, (2) considerably heavier pipe used initially and backfilled would have the same result.

In another incident a large-diameter, approximately 1.3-specific-grav-



PROFILE, BOTTOM WATER VELOCITY, and bottom pressure anomaly are plotted for 50-year maximum design hurricane in 40-ft. water. Fig. 1.

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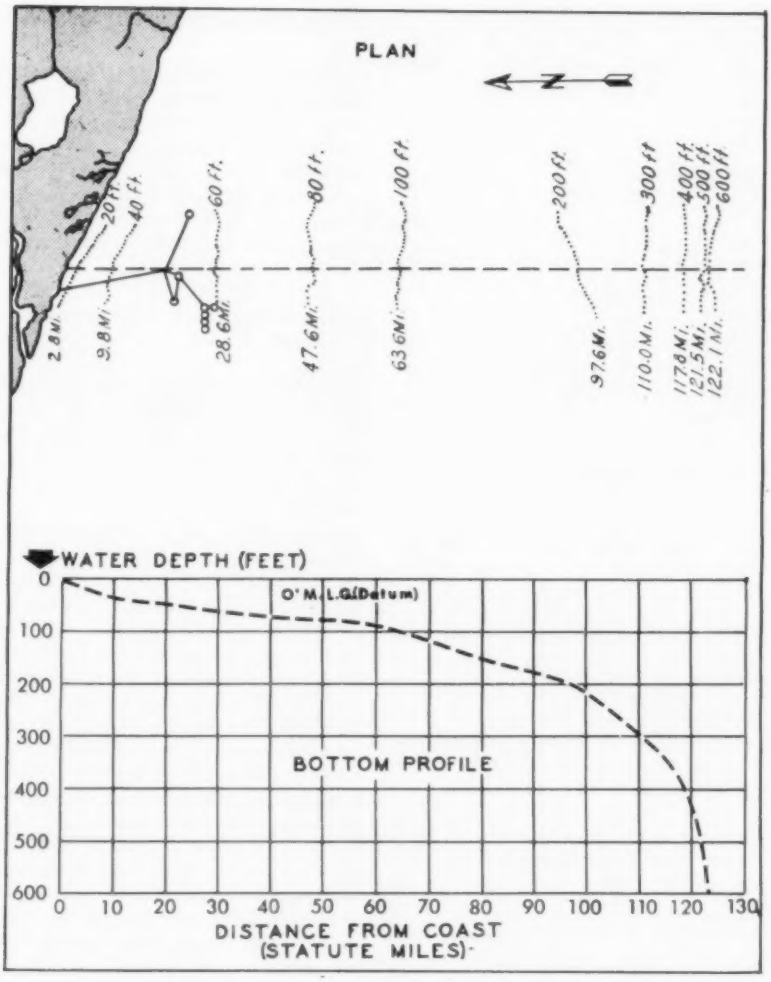


SHALLOW-WATER WAVE traverse is shown off Grand Chenier, La. Fig. 2.

ity line in marsh area floated to the surface during backfilling of the pipe ditch. A clay and silt combination of specific gravity 1.3 had been deposited as backfill during the excavation of the ditch and allowed to dry with a resulting change in specific gravity to 2.0. During backfilling, the fill was swept into the ditch causing the heavier material to displace the pipe.

The recommendations are the same as those offered in the foregoing case. However, a stipulation should be placed in the contract as to method of backfilling. If this hardened material is placed on top of the pipe instead of being slid into the ditch beside it, chance of displacement would lessen.

Under somewhat different circumstances a small-diameter pipe failed because of lateral and longitudinal displacement. The line, lying on the bottom without cover, was acted upon by strong tides perpendicular to the pipe. The horizontal displacement pulled a 90° tube turn straight with a resultant pipe failure in tension upstream of the ell. It is recommended that all pipe be adequately buried in areas subject to storm tides.

Checks on some other lines in the storm area revealed the hurricane had caused little change in location or position. Most of these lines were of smaller diameter, higher specific gravity, and the ditches had had longer time for rehealing.

Analyzing Wave Action

Difficulty in analyzing these hurricane waves is due to the number of elements involved in modifying a given wave type moving over an arbitrary path. A study made by Gulf Consultants, of Houston, for the 26-in. Tennessee Gas Transmission Co., Kinder-to-C.A.T.C. line, produced the data on wave heights and characteristics shown in Fig. 1 plan and profile, Fig. 2 wave height vs. distance from shore, and Fig. 3 wave characteristics.

Bottom current effects . . . The passage of a wave will cause a pronounced pressure differential and current along the bottom, with the current traveling in one direction for the crest and in the opposite direction for the trough. Fig. 1 gives the calculated numerical values of pressure differential and bottom velocity for a 50-year storm in 40 ft. of water. The pressure differential is 1,000 lb. per sq. ft. and the differential water velocity at the bottom is 14 ft. per second, with the total wave height being 16 ft. from trough to crest.

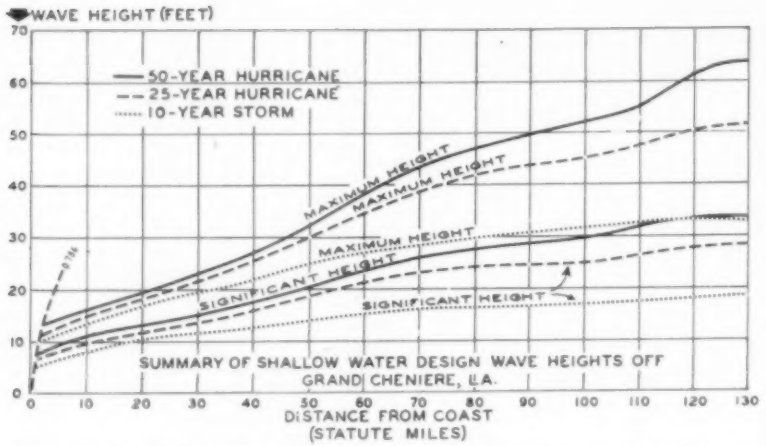
This wave for the 50-year storm has been dissiptated by bottom friction and percolation as it traveled over the Continental Shelf to the 40-ft. contour. Actually the shelf has a sheltering action reducing the incoming waves. The calculated wave height at the 600-ft. contour was 63 ft., which shows a marked modification by reason of this long shelf. Counting this reduction blessing, the modified wave still has tremendous forces acting on the bottom sediments which if unstable are stirred to solution. Experiments prove the solution is not appreciably reduced in specific gravity.

Soil behavior . . . With the shearing forces removed by dissolution, objects of lighter specific gravity will become buoyant and float to the surface exposing themselves to the storm tides. It is vital that the depth of burial be clear of the zone of breakdown in soil shearing strength during wave action. Ample time also must be allowed for the latticework of the soil to be reformed and increase in shearing strength.

The soil conditions in some small areas along the Gulf Coast are even more unstable. The bottom is of such solution that during periods of moderate wave action the mud assumes the same profile as the waves, dissipating much energy and resulting in a relatively calm area in a stormy sea.

One such area reported by fishermen is approximately ½ mile long by 1 mile wide, and is a form of refuge in moderately rough weather. To the engineer, such unknown areas are headaches with the possibility of a too-heavy pipe sinking or a too-light pipe floating. If in such an area the wave action approaches the resonance of the pipe, extreme vertical fluctuations can be induced in the pipe.

Sand under wave action will have bottom movement derived from the fluctuating of bottom pressure and velocities. A short period of forward velocity (under the crest) will move more sand than the longer period of



WAVES ARE DISSIPATED by bottom friction and percolation in traveling over Continental Shelf. Fig. 3.

less velocity in the opposite direction. The sand particles are bounced along the bottom in much the same way that a bouncing ball travels across a flat surface. Characteristics of movement will differ with varying sizes of sand particles, larger grains having more net transport than the smaller particles.

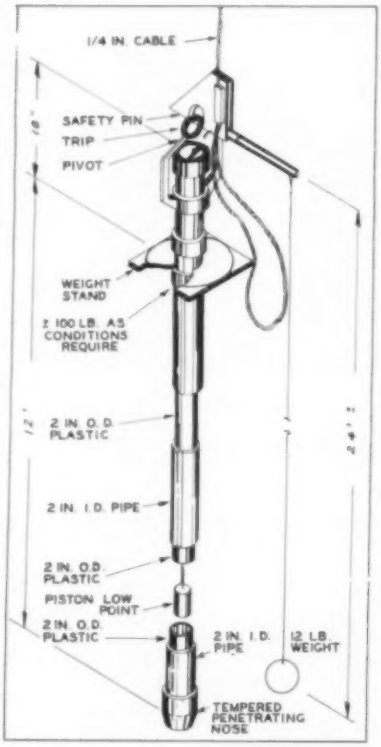
Longshore and rip currents are other conveyors of sand in the zones of beaches and sand bars. Although the sand buildup is in most cases equal to the erosion, holding the area in equilibrium, any channel through the area will break this equilibrium causing a rapid filling of the ditch. Uncovered pipe in this ditch could follow the sand level vertically. Regions of shell reefs and some sandstone have been noted along the Gulf Coast. If undetected during preliminary subsurface reconnaissance, these areas could cause much inconvenience, either from the standpoint of contamination of fish, shrimp, and oyster beds or from possible spanning of pipe.

Subsurface Studies

From the above information, it is basic that the soil characteristics be studied. A relatively inexpensive and sufficiently accurate method has been developed by B. Kullenberg for subsurface investigation. This plan was used by Sea Engineering & Salvage, Inc., of Houston, in the subsurface survey of Tennessee Gas Transmission's 26-in. Kinder-to-C.A.T.C. line in the Cameron, La., area. The depth of use is not restricted, permitting coring at marsh elevation or in unlimited depths of water. With proper planning as many as 60 undisturbed cores can be obtained in 1 day.

The described apparatus is shown in detail by Fig. 4 in "Subsurface Exploration and Sampling of Soils for Civil Engineering Purposes" by M. Juul Hvorslev. A 2-in.-o.d. plastic liner inside the apparatus holds the sample until analysis can be made. The highly effective part of this apparatus is its adaptability to subsurface investigations for a pipeline-route survey. It is extremely portable and can be used from a shrimp boat or adapted to a marsh buggy for marsh samples.

With a 12-ft. core barrel, cores to 11 ft. can be procured in soft material, these being ample for this type of survey. With a minimum of lab



CORING APPARATUS is used in marine soil survey. Fig. 4.

equipment, specific gravities, water contents, and shearing strength can be determined accurately enough to give a satisfactory concept of required design. This method does not produce the accuracy of specially equipped labs, but it is entirely adequate for marine pipelining. The beauty of this method is that the complete outfit can be carried in a pickup, and on-the-spot analysis and recommendations can be made.

Soil conditions vary . . . To insure the specific-gravity calculations being made under the same conditions as those under which the pipe will be laid, the core should not be removed from the plastic liner until the analysis is ready. Any drying of the sample produces higher gravities than those found under actual conditions. The undisturbed soft clay phases in the western Louisiana gulf vary in specific gravity from 1.4 to 1.5 with the clay in the area of the delta being slightly lighter. Silt phases cover specific gravities from 1.5 to 1.7 and sand phases range from 1.7 to 2.1.

A very stiff clay called Beaumont, found near the surface in large areas of the western Louisiana and eastern Texas Gulf Coast, varies in thickness to a maximum of 1,000 ft. in the Calcasieu-Mermentau area. This phase of clay is drier and in its natural state varies in specific gravity from 1.7 to 2.1. On or near the surface, Beaumont creates excellent bearing area for pipelines, the principal disadvantage being the difficulty of trenching in its clay phase. The sand and silt phases are more readily trenched or jetted. These Beaumont outcrops apparently run in bands paralleling the coast with softer sediment in the area between.

This observation upholds the theories pertaining to the glacial ages in the Pleistocene epoch taking place some 1,000,000 years ago. The receding waters, held at the poles in form of glaciers during these ages, exposed the present shelf to approximately the minus 300-ft. contour. During the fluctuations definite ridges or cheniers were formed like those noted in South Louisiana and on the Continental Shelf.

Design complications . . . A pipeline constructed perpendicular to the present coast will have a series of soft and then firm foundations to traverse. Complications in design can arise if these conditions are coupled with the mud areas described earlier. A method developed for analyzing the stresses induced in pipe by uneven set-

tling was originated by Robert O. Reid, associate of Gulf Consultants, and was published in the "Proceedings of Second Conference on Coastal Engineering." The computations require specific gravity (natural state), water content, and shearing strength, along with pipe-design dimensions.

Stress Calculations

As evidence to the hypothesis that larger-diameter pipes are more critical and therefore need more attention in design, note the calculations below of stresses induced in different size pipe.

Assumptions

1. Pipe filled with fresh water during construction.
2. Shear strength of soil, 50 lb. per sq. ft.
3. Water content of soil, 100 per cent.
4. Maximum deflection of 6 ft. to firmer foundation.
5. Specific gravity of soil, 1.4.
6. Spans of 250, 500, and 1,000 ft. are used.

The method of presentation, if properly used, can show the necessary pipe gravities at a glance. Fig. 5, a log of the cores plotted to an exaggerated vertical scale, with equal lines of specific gravity, yields a very revealing picture.

With the above knowledge, recommendations can be made as to the specific gravities required, depth of burial of pipe, methods of backfilling, and the possible use of water-filled pipe to aid in the maintaining of pipe at established grades.

The following is a list of lab material required for analysis:

Scale—tenths of grams
Burette—50 cc.
Assorted flasks
Assorted beakers
Slide rule
Hot plate
Oven boxes

Methods and samples of calculations:

Specific Gravity

Total weight of material and flask	= 67.2 g.
Minus weight of flask	= 21.2 g.
	46.0 g.
Total volume of flask	= 50.0 cc.
Minus volume of water	= 26.0 cc.
	24.0 cc.

$$\text{Specific gravity} = \frac{Ws}{Vs} = \frac{46.0}{24.0}$$

$$= 1.92$$

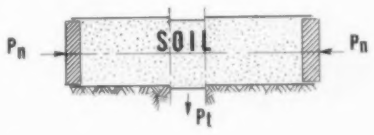
Ws = weight of solid substance (g.) natural state.

Vs = volume of solid substance (cc.)

Pipe Size O.d. & W.T.	Pipe S.G.	Deflection for Spans of 250 ft.	500 ft.	1,000 ft.	Stress K/In.² 250 ft.	500 ft.	1,000 ft.
16 x .406	1.65	Soil will carry load				None	
20 x .406	1.65	1.6	4.8	6.0	9.7	18.1	14.0
26 x .500	1.65	3.4	6.0	6.0	43.0	40.0	25.5
30 x .500	1.66	3.5	6.0	6.0	41.7	41.0	28.9
26 x .500	1.35	1.5	4.1	6.0	12.1	16.9	11.8
30 x .500	1.36	2.8	6.0	6.0	29.0	36.0	23.9

Shearing Stress

A direct double-shearing ring apparatus in which a tangential load is applied to the middle ring until failure in shear.



Water Content

The water or moisture content w is usually expressed as the weight of water to the weight of solid.

$$W = \frac{Ww}{Ws} \times 100$$

Ww = weight of water (g.)
Ws = weight of solid (g.)

Both the Ww and Ws are obtained by direct weighting before and after the drying.

Sample before drying	= 82.4 g.
Sample after drying	= 61.8 g.
Water cooked out	= 20.6 g.

$$W = \frac{20.6}{61.8} = 33 \text{ per cent}$$

References

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4. Gulf Consultants, "Effects of Hurricanes on the Kicat Pipeline of Grand Cheniere, La."
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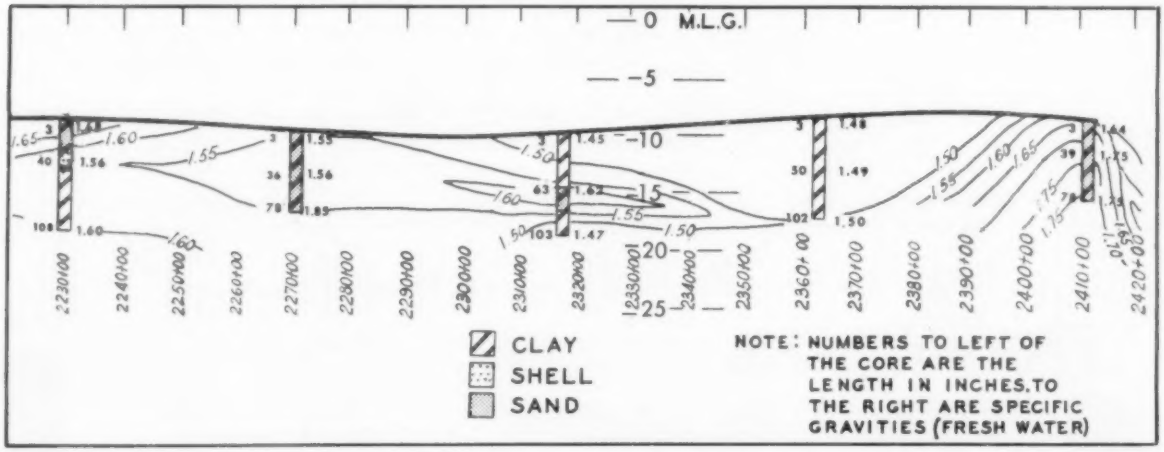
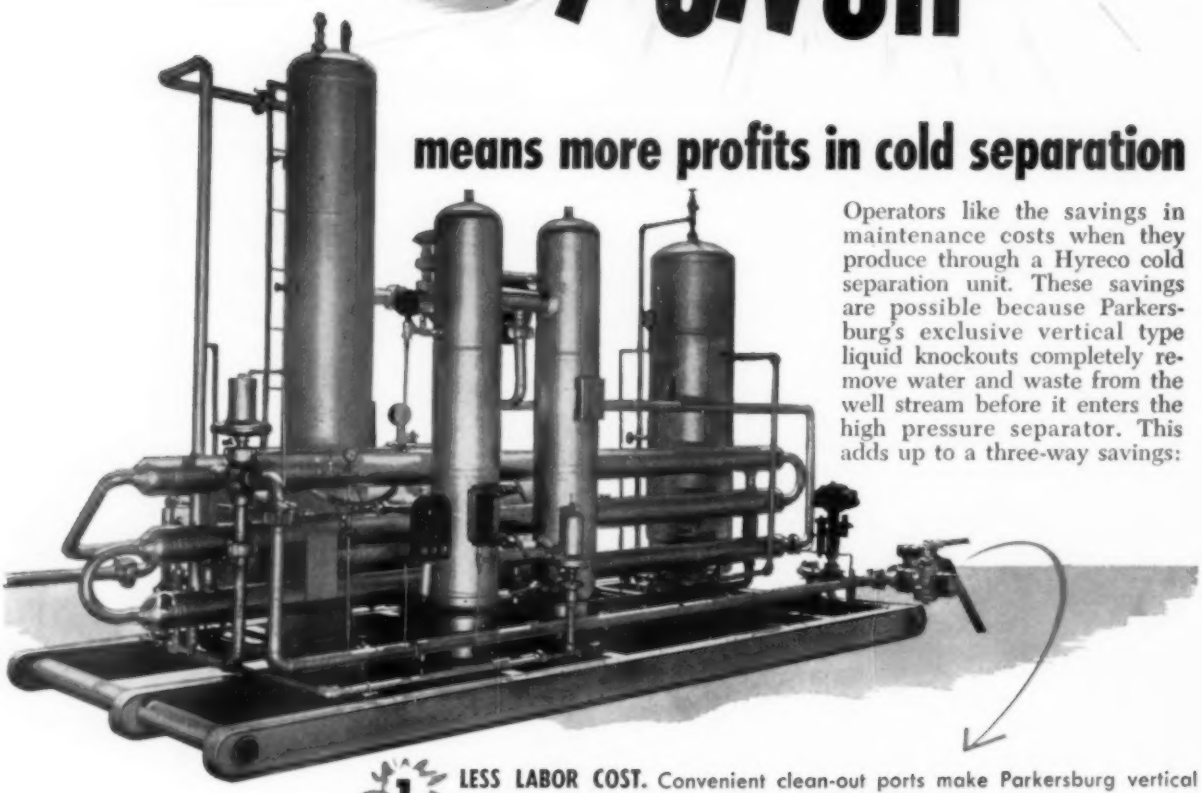


LOG OF CORES is plotted with equal lines of specific gravity. Information indicates requirements for burying pipe safely. Fig. 5.

A Parkersburg Hyreco's **LIQUID**

KNOCKOUT PUNCH



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PESA

New Tools for the Gas Dispatcher

When peak-day volume increases sixfold, dispatching techniques must keep pace. Here's how one system provides the tools that get the job done

By D. E. York

THE Charleston Group Companies of the Columbia Gas System must now dispatch over six times the volume of gas they did 20 years ago. On the peak day of the winter 1936-37 we delivered approximately 285 M.M.c.f. The peak day for 1956-57 was 1,873 M.M.c.f.

To handle these increased volumes, the dispatcher must have a more efficient system of dispatching than was used 20 years ago. He must have competent personnel able to make correct decisions under pressure. This personnel must have full control over all major delivery points, and the communications system must be 100 per cent reliable.

The dispatcher receives certain data which he reduces to information needed for dispatching. For example, he receives static pressures, differential pressures, temperature, and specific gravity for the purpose of computing gas flows. Since our dispatcher receives approximately 250 bits of these data each hour by telephone, logs them, and then makes his computation, it becomes a very time-consuming operation. It requires some 40 minutes, leaving him only 20 minutes for actual dispatching.

Author is superintendent of communications of the Charleston Group Companies, Columbia Gas System.

We are installing a new tool for the dispatcher which will automatically collect these data, reduce it to information, record it, and at the same time notify the dispatcher of any change in trend throughout the system. This new tool also makes it possible for the dispatcher to control these variables from a centralized point assuring that competent people have full supervision over gas deliveries at all times.

Dispatching Setup

Fig. 1 shows the geographical layout of our pipeline system. For the purpose of dispatching this system was divided into two dispatching centers, one in Charleston, W. Va., and the other in Dranesville, Va. All gas to our western markets will be dispatched from Charleston and all gas to our eastern markets will be dispatched from Dranesville. Since the Charleston and Dranesville systems will be identical, only the function and operation of the Charleston system will be described.

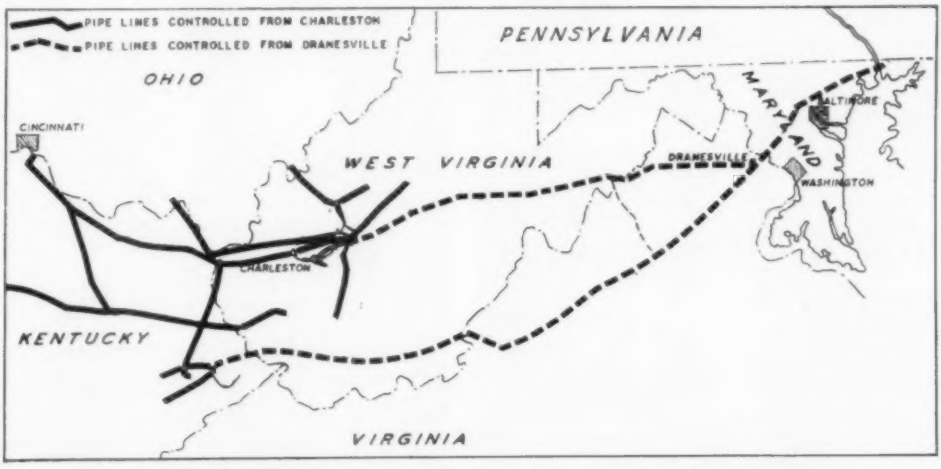
Pressures, temperatures, and flows will be telemetered from approximately 50 locations to Charleston. Control over all major valves and regulators at these five locations will be affected from Charleston. The telemetered information will be transmitted over our privately owned telephone system, over leased lines, and over microwave.

How it works . . . The basic system is very simple, consisting of a Bristol telemeter transmitter which measures the variable and converts it to an electrical impulse. This impulse keys a tone transmitter which transmits a signal to the Charleston office. A separate tone frequency is assigned to each pressure and all tones are transmitted continuously and simultaneously.

Since the gas flow is the variable with which we are most concerned, let us consider how the measurement, transmission, and recording of a flow are accomplished. As mentioned before, several bits of data are necessary to calculate flow. The flow equation $Q = C\ (hP)^{1/2}$ contains several quantities. Some of these quantities are telemetered, others are fixed constants which are applied automatically by the data-reduction system. Correlation for a change in orifice-plate size is made by plug in resistor networks at Charleston.

Flow meter . . . Fig. 2 shows a pressure-compensated flow meter developed by Bristol Co. The differential

STATIONS



PIPELINE SYSTEM of Columbia Gas System Charleston Group Companies. Fig. 1.

pressure is measured by a Barton cell mounted on the back of the instrument. The line pressure is measured by a pressure spring mounted in the case of the instrument. By the action of these two elements, the angular position of the cam follower will, at all times, be indicative of the product of the differential pressure and the line pressure. The cam has a square root cut which automatically extracts the square root of this product.

We now have pressure-compensated flow. This is the correct flow for certain base conditions. Correction for other than base conditions will be done by the dispatcher, where desired. The accuracy of the Bristol instrument is within 1 per cent of full-scale readings for a range of 20 per cent to 100 per cent of the differential pressure and 40 per cent to 100 per cent of the line pressure.

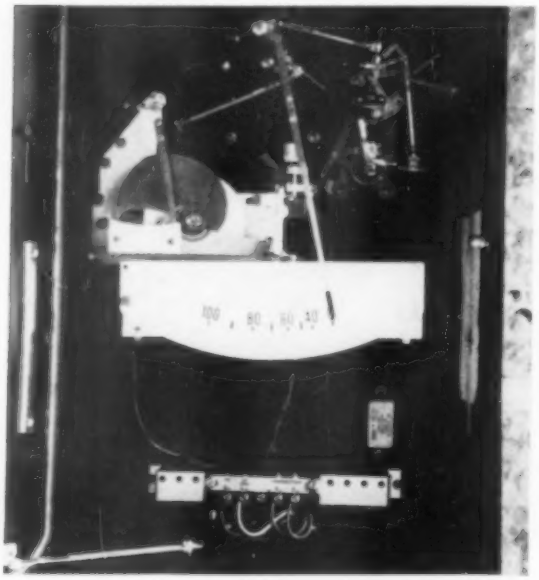
Signals from the remote instruments operate relays in the tone receivers at Charleston. Fig. 3 shows the Panellit information system installed at our headquarters office in Charleston, W. Va.

Information System

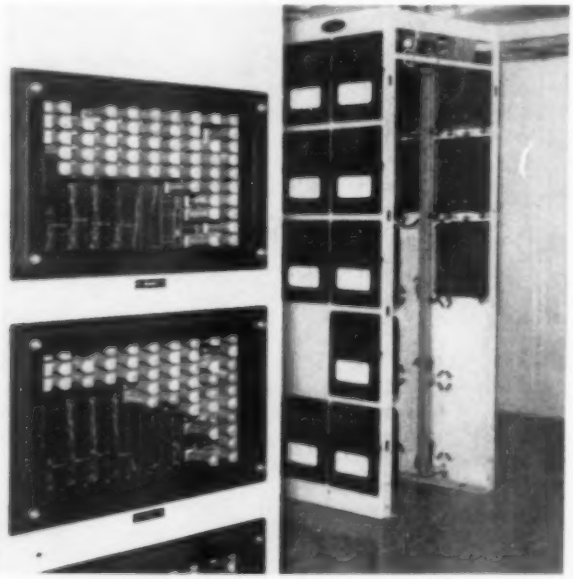
Fig. 4 is a block diagram of this system. Notice that the output of the tone receivers is fed to three different points. One point is a jack field located in the operating console. The dispatcher may read the instantaneous value of any variable by plugging a Bristol receiver into one of these jacks. The second point is an alarm system. All major variables are being scanned constantly for off-limit conditions. The limits are set by the dispatcher at the console. If the variable goes above or below these desired operating limits, it will be detected instantly by the alarm system and both a visible and audible alarm will be initiated.

The third point to which the output of the tone receiver is fed is the

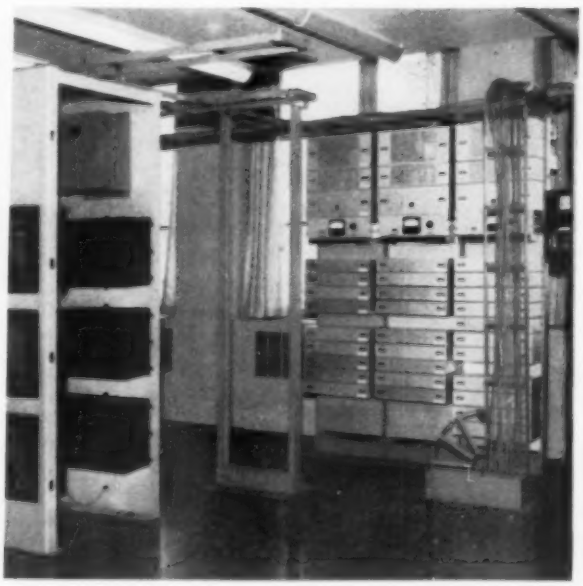
STATIONS

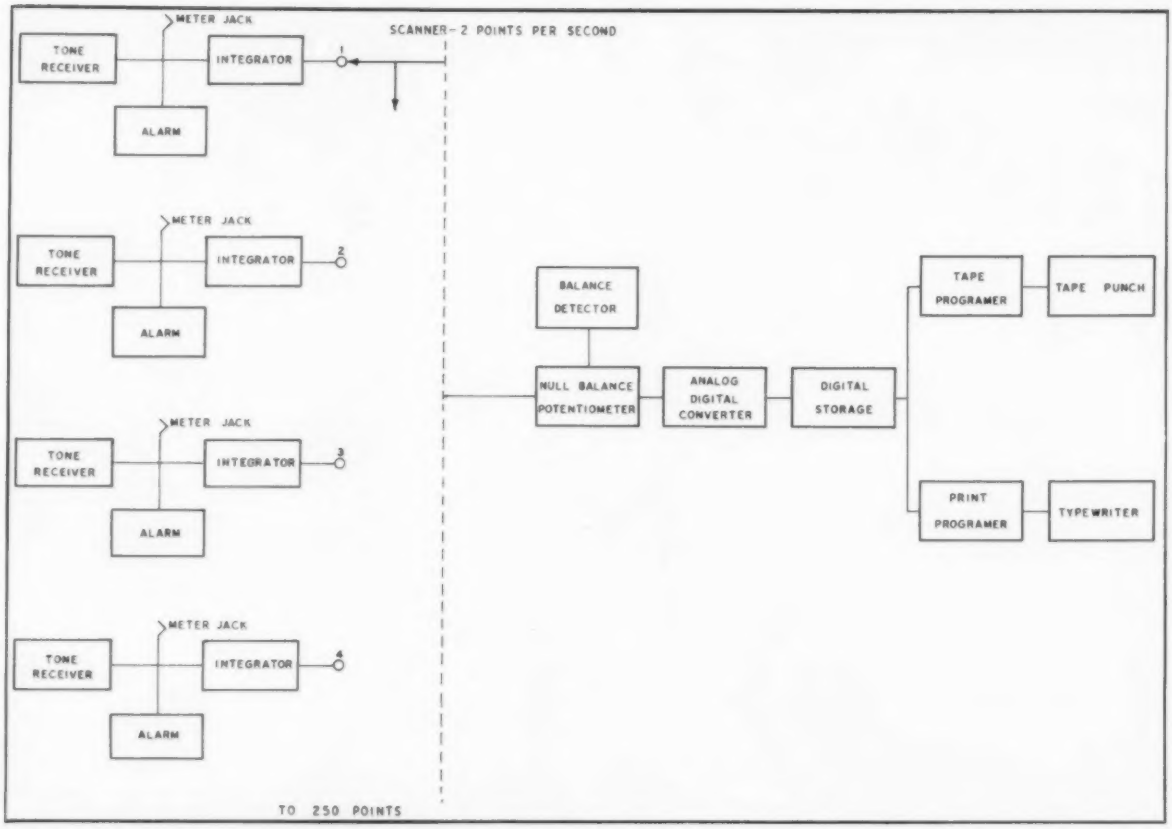


FLOW IS MEASURED by pressure-compensated flowmeter. Fig. 2.



INFORMATION SYSTEM reduces data to usable form (above and two photos below). Fig. 3.





OUTPUT OF TONE RECEIVERS in information system is fed to jack field in operating console, to an alarm system, and to the integrator. Fig. 4.

STATIONS

integrator. The integrators receive readings from the remote station every 5 seconds. These readings are time compensated and connected to a second scanning system. Once each hour or on demand, this scanning system will scan all integrators and initiate a printout on the logging system. If an orifice-meter tube is shut down between logging cycles, a printout is automatically initiated to record the gas passed since the last log.

Fig. 5 shows the null-balance potentiometer and analog-to-digital converter. The converter is a shaft-position type.

Logging meters . . . Fig. 6 shows the console and logger. Gas flows are printed in M.c.f. per hour, temperatures are averaged and printed in degrees. The instantaneous value of pressure, at the time of logging, is printed. The center section of the console contains the equipment necessary to read the instantaneous values of variables and the push buttons for operating valves and regulators.

The wing sections contain the equipment for setting the high and low operating limits and the controls for selecting the valves to be operated. Seven of the meters mounted in the center of the console are connected to cords and are used in conjunction with the jack field. The jack lamps and cords are color coded so the meter having the proper scale may be plugged into the correct jack. However, no damage will result if the wrong meter is used since all meter movements are identical.

It is not necessary for the dispatcher to plug these meters into the jack field in order to get his pressure readings. These readings are printed automatically for him. The jack field is merely to give the flexibility necessary to observe the instantaneous readings.

The eighth meter is a potentiometer used to set the high and low operating limits. A point is selected by stopping the scanner on that point and the meter connected to it by a test switch. The controls in the wing sections are then adjusted until the meter reads the desired limits. If a pressure goes above these limits, its jack lamp will light and a buzzer will sound. The dispatcher may then plug one of the receivers into that jack and read the variable.

Valve Operation

Each valve or regulator has its own control plate. Mounted on each plate is a control button and three lamps to indicate the position of the valve. When the button is pushed, a series of pulses are sent out to that valve. These pulses are checked and will be accepted by that particular valve only. When the proper valve is reached, a white light comes on indicating he has reached the desired valve. He then presses the master operating button on the center section of the console which opens or closes the valve. The white lamp will then go out, and either a red or green lamp will come on to indicate the new position of the valve.

In the case of raising or lowering the set point of a reguator valve, the controllers are designed to permit only 1 per cent change per second with a maximum change of 10 per cent without resetting.

Fig. 7 shows one of the valve actuators mounted on a plug valve. This actuator is a pneumatic motor of the moving-vane type and is op-

OIL AND GAS

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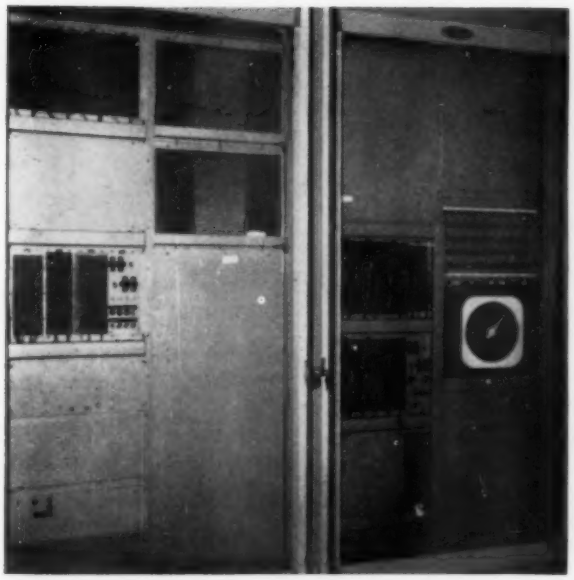
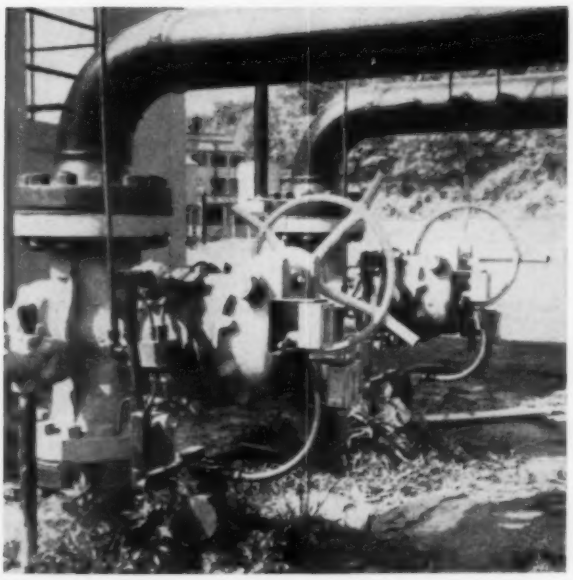


POTENTIOMETER and analog-to-digital converter. Fig. 5.



VALVE ACTUATOR is mounted on plug valve. Fig. 7.

STATIONS

erated by natural gas. Opening or closing a valve is done by operating one of two solenoids mounted on the actuators. The position of the valve is indicated by limit switches mounted on the back of the actuator which closes a circuit and transmits a signal back to Charleston.

Regulators are controlled by Foxboro M-40 remote controllers. These contain reversible motors mounted in an explosionproof case on the back of the instrument. Control of all regulators and valves at a particular station is accomplished over a single tone channel. The tone transmitter is pulsed by Westinghouse Visicode equipment. Since it is necessary for 10 different relays to latch up in a proper sequence, the danger of malfunction is very remote.

Fig. 8 shows a typical field installation. A two-room metal building is used to house the equipment—one room contains the meta-meter transmitters, the other room contains the electronic equipment. A fire wall separates the two rooms. Emergency power equipment is provided at both the remote location and operating center.

Results

Although we have not had the operating experience necessary to predict what the faults of the system will be, the results of the initial installation have been very gratifying.

METAL BUILDING houses meta-meter transmitters, electronic equipment. Fig. 8.

The design of this system is basically simple and readily expandable. Equipment installed at the remote location has been kept as simple as possible.

Since this is standard equipment, our present communication and gas-measurement personnel are well acquainted with it and have had no difficulty in servicing it. All the complex equipment associated with this system is in the Charleston operating center where qualified personnel are always available for service.

The system is so designed that data can be programed from it and fed to a computer if desired. To make this a fully automatic system, it would be necessary only to add a feedback loop from the computer to the controlled devices.

Considerable savings are being effected by the use of this equipment in addition to giving us much closer control over our gas deliveries. This is particularly important in these days of service agreements providing contract demands. **End.**

CONSOLE AND LOGGER. Gas flow, pressure, and temperature are printed. Fig. 6.

STRINGER-BEAD WELDERS add another joint of pipe. Competent welders and close inspection are essential in this key operation.

Let's plug up some of those

Loopholes in the Pipeline Codes

Here's a plea for a more realistic approach to designing a set of specifications that both the user and manufacturer can live with

By R. G. Strong and A. G. Barkow
Natural Gas Pipeline Co. of America

THE OLD proverb, "There's many a slip 'twixt the cup and the lip," can well be paraphrased in modern pipelining by saying, "There's many a slip between the open hearth and the ditch."

Specifications and standards are now commonly used as controlling factors in the design of pipelines, production of pipe materials, the welding and laying of the lines, and the final testing and operation. They have been found not only adequate but frequently superior to former individual specifications.

These standards express the judgment of design engineers and also the ability of the fabricator to produce material and services in conformity with these desires.

Yet the standards are worthless if not followed implicitly both in word and intent. The written word can be interpreted according to individual interest. Where such interest is not in harmony with intent, gross misinterpretations may result, working to the advantage of the individual but undesirable to the industry.

Loopholes in Standards

All codes, specifications, and standards have inherent loopholes that can be plugged only by individual integrity, or they may be used in all honesty to further the practice of the individual. While not wishing to be critical of the standards or their application, it is our intent to expose some of the loopholes interpretations.

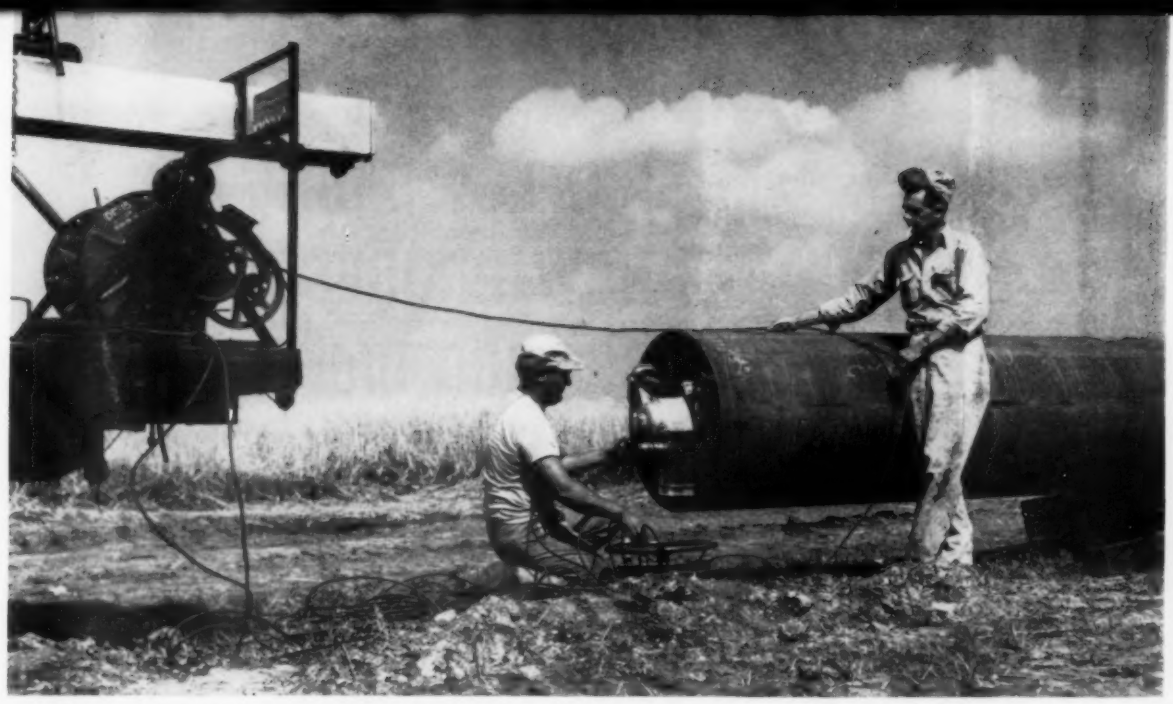
Line-pipe standards . . . Line pipe for gas and oil transportation and field use are produced under two American Petroleum Institute standards:

- A.P.I. Standard 5L, Specification for Line Pipe.
- A.P.I. Standard 5LX, Specification for High-Test Line Pipe.

A.P.I. Standard 5L was written to specify properties and testing of mild-steel line pipe and is divided primarily into two classifications with physical and chemical properties as shown in the accompanying table.

Examining these requirements it will be noted that the steel should be readily weldable, ductile, and comparatively free from excessive notch sensitivity. Willfully introduced, inherent stresses are not anticipated. Thus the designer automatically turns

	C	Mn	P	S	Yield	Ult.	Elongation
Grade A	0.22	0.95	0.04	0.05	30,000	48,000	21-35
Grade B	0.27	1.35	0.04	0.05	35,000	60,000	18-30



X-RAY head is placed into pipe for radiographic inspection. This important tool can provide quality control and correct defective material.

to these steels when properties other than maximum strength and minimum wall thickness are desired.

Frequently these standards are applied to installations where excessive superimposed static or dynamic stresses may and do occur. They also are used in locations of concentrated property and habitation. It is expected that the material so specified does possess the properties desired by the designer. Naturally, allowances are made for the loss of higher strength and reduced weight, factors the engineer has calculated.

Are standards met? . . . Does the engineer receive pipe that meets his need and fulfills his requirements? The answer may be found in examining Table 1, showing typical chemical and physical properties of finished pipe as reported by the pipe manufacturers. Examining this table it will be noted two carbon aims apparently are used, one being about 20 points carbon plus or minus 3 or 4, the other about 25 points carbon plus or minus 3 or 4.

The manganese range also shows two distinct aims, the first in the neighborhood of 50 points, the second in the neighborhood of 70 points.

Physical ranges are usually indicative of chemical ranges, but in one instance, it will be noted that physical properties are high while chemical properties are comparatively low. The comparable analysis shows relatively high chemistry and low physical properties. This would indicate that another factor, possible rolling practice, is a matter of concern and control.

It also is of interest, in studying this table, to note that only 16 per cent of the physical test results are in what might be termed an acceptable range; 26 per cent could well be classified as 5LX42; 37 per cent meets the requirements for 5LX46; and 21 per cent exceeds the minimum requirements of 5LX52.

High-strength line pipe complying with A.P.I. Standard 5LX also provides the engineer with several grades

PIPE AND PIPING

of pipe based on a specified minimum yield strength. Naturally it is expected that chemical and physical properties will be established to meet these grade requirements. The engineer balances the desirable properties and the undesirable properties with the conditions of construction. The pipe manufacturer is bound by wording of the standard to attain the minimum physical properties—which usually far ex-

TABLE 1—RANGE OF ACTUAL CHEMICAL AND PHYSICAL PROPERTIES, A.P.I. STANDARD 5L PIPE

Size (in.)	Gr.	Per cent carbon	Per cent man.	Yield point (1,000 psi.)	Ultimate tensile (1,000 psi.)	Per cent elong.	Type
12¾ x 0.500	A	0.06-0.20	0.30-0.59	42-48	49-62	41-48	EW
4½ x 0.188	B	0.21-0.26	0.68-0.74	57-67	68-74	32-36	EW
4½ x 0.188	B	0.20-0.22	0.52-0.56	52-59	62-67	30-36	EW
4½ x 0.237	B	0.25-0.27	0.44-0.53	46	69	35-40	Smls.
6⅝ x 0.188	B	0.19-0.26	0.37-0.51	40-52	68-77	32-40	EW
6⅝ x 0.188	B	0.19-0.23	0.50-0.70	54-62	62-72	32-34	EW
6⅝ x 0.219	B	0.19-0.21	0.47-0.59	45-53	62-66	34-36	EW
6⅝ x 0.219	B	0.18-0.26	0.62-0.85	47-60	61-69	34-40	EW
8⅝ x 0.250	B	0.21-0.25	0.50-0.78	41-47	61-69	30-42	EW
8⅝ x 0.250	B	0.18-0.26	0.65-0.92	46-52	61-67	35-38	EW
8⅝ x 0.250	B	0.26-0.30	0.52-0.56	51-55	73-79	32-37	Smls.
10¾ x 0.250	B	0.20-0.24	0.63-0.80	44-48	60-63	37-39	EW
10¾ x 0.250	B	0.24-0.29	0.62-0.78	48-51	64-70	33-34	EW
12¾ x 0.250	B	0.17-0.26	0.45-0.66	52-61	61-74	36-43	EW
12¾ x 0.250	B	0.20-0.27	0.69-0.80	44-52	60-67	32-38	EW
12¾ x 0.500	B	0.25-0.27	0.54-0.64	41-46	67-71	36-39	Smls.
16 x 0.500	B	0.23	0.63	42	72	43	Smls.

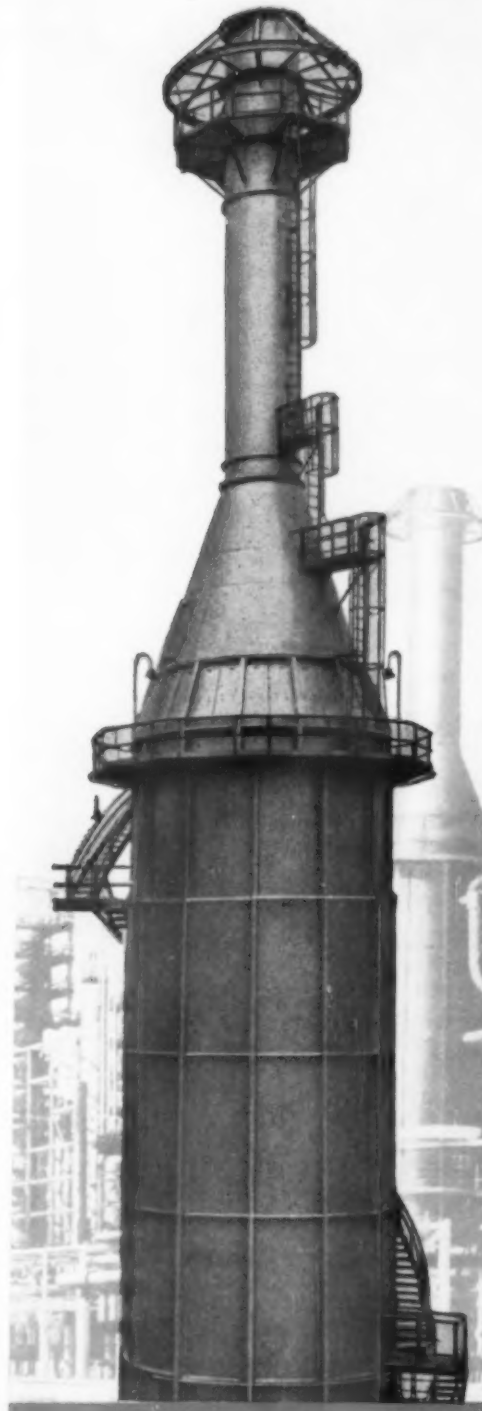


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TABLE 2—RANGE OF ACTUAL CHEMICAL AND PHYSICAL PROPERTIES, A.P.I. STANDARD 5LX PIPE

Size (in.)	Gr.	Per cent carbon	Per cent man.	1,000 psi. Yield point	1,000 psi. Ultimate tensile	Per cent elong.	Type
6⅝ x 0.250	X42	0.22-0.26	0.70-0.90	51-56	66-73	29-37	EW
8⅝ x 0.250	X42	0.23-0.38	0.76-0.89	45-49	64-74	28-38	EW
12¾ x 0.281	X42	0.20-0.26	0.61-0.80	43-50	62-72	32-42	EW
16 x 0.250	X42	0.24-0.30	0.55-0.109	49-63	66-72	28-40	EW
16 x 0.250	X42	0.21-0.26	0.52-0.78	53-57	68-73	26-40	EW
16 x 0.344	X42	0.23-0.29	0.50-0.57	48-51	71-74	31-33	EW
16 x 0.500	X42	0.24-0.26	0.40-0.45	50-51	71-75	33	EW
20 x 0.250	X42	0.27	0.50	57	76	31	EW
20 x 0.312	X42	0.21-0.32	0.68-0.119	50-64	65-85	30-50	EW
20 x 0.250	X42	0.25-0.27	0.82-0.116	47-55	73-84	35	Smls.
20 x 0.375	X42	0.25-0.28	0.70-0.92	47-56	73-80	35-37	Smls.
24 x 0.250	X42	0.23	0.52	57	77	30	EW
16 x 0.250	X46	0.20-0.28	0.55-0.72	52-61	73-81	29-32	EW
20 x 0.375	X46	0.30	0.77	59	82	30	EW
20 x 0.500	X46	0.26	0.70	56	72	27	EW
24 x 0.375	X46	0.30	0.92	62-64	82-85	24-30	EW
24 x 0.500	X46	0.25-0.29	0.60-0.76	56-59	79-80	31-34	EW
26 x 0.500	X46	0.30	0.92	64	85	24	EW
20 x 0.250	X52	0.23-0.30	0.104-0.123	57-65	74-85	32-40	EW
24 x 0.250	X52	0.24	0.104	64-65	78-82	30-34	EW
24 x 0.312	X52	0.25	0.104	60-64	83-87	31-33	EW
24 x 0.406	X52	0.26	0.121	64-67	85-86	30-34	EW
26 x 0.500	X52	0.25	0.96	57-60	78-90	34-38	EW
30 x 0.344	X52	0.26-0.31	0.96-0.109	55-65	80-94	26-30	EW
30 x 0.375	X52	0.25-0.28	0.103-0.117	62-64	85-90	28-30	EW
30 x 0.500	X52	0.26-0.31	0.101-0.103	60-62	83-91	30-32	EW
30 x 0.500	X52	0.25-0.30	0.101-0.117	53-57	81-88	32-36	EW
36 x 0.438	X52	0.22-0.29	0.87-0.118	55-63	73-84	30-36	EW
36 x 0.500	X52	0.22-0.27	0.100-0.115	56-65	76-83	30-36	EW

ceeds the minimum, but is this the real intent of the standard?

Table 2 reports chemical and physical properties of the various grades of pipe in the 5LX classification in several sizes as produced by various mills. Examining this table, it will be noted there is a compliance with the standard as written. However, is the engineer receiving pipe that meets his need and fulfills his requirements?

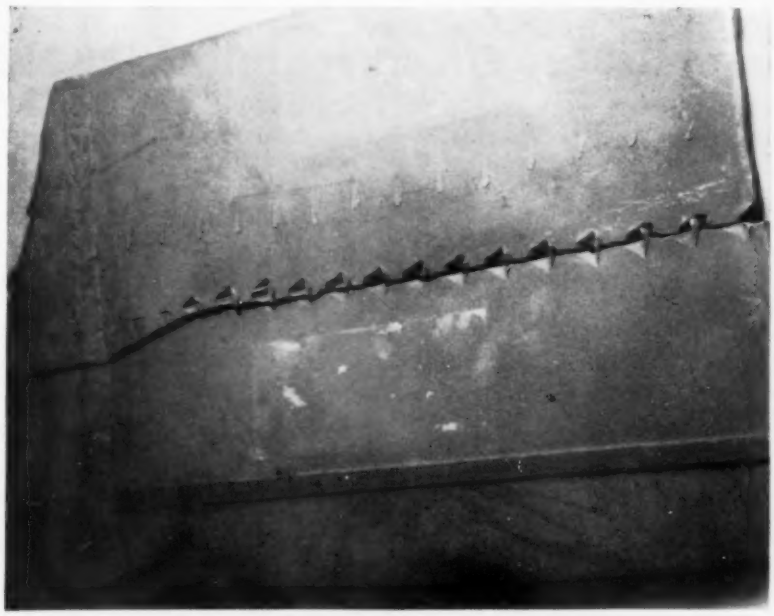
Conflicting claims . . . Pipe manufacturers are represented on the standard committees. They know the intent of the standard. They know the problem of the engineer. They know the field conditions and understand the problems of pipeline construction. They claim they are providing pipe equal to or better than specified. They claim their production processes are controlled to the best of their ability. However, a careful study of the records taken from recent mill test reports show vast and unexplained differences. It will be noted that some mills actually do control their products within a reasonable range. Others do not.

A glance at Table 2 will show that the 5LX52 grade has physical properties within an acceptable range although here again the top end exceeds the required minimum by as much as 27 per cent. While the manganese is fairly constant, two distinct aims for carbon may be noted: one above 25 points, the other below.

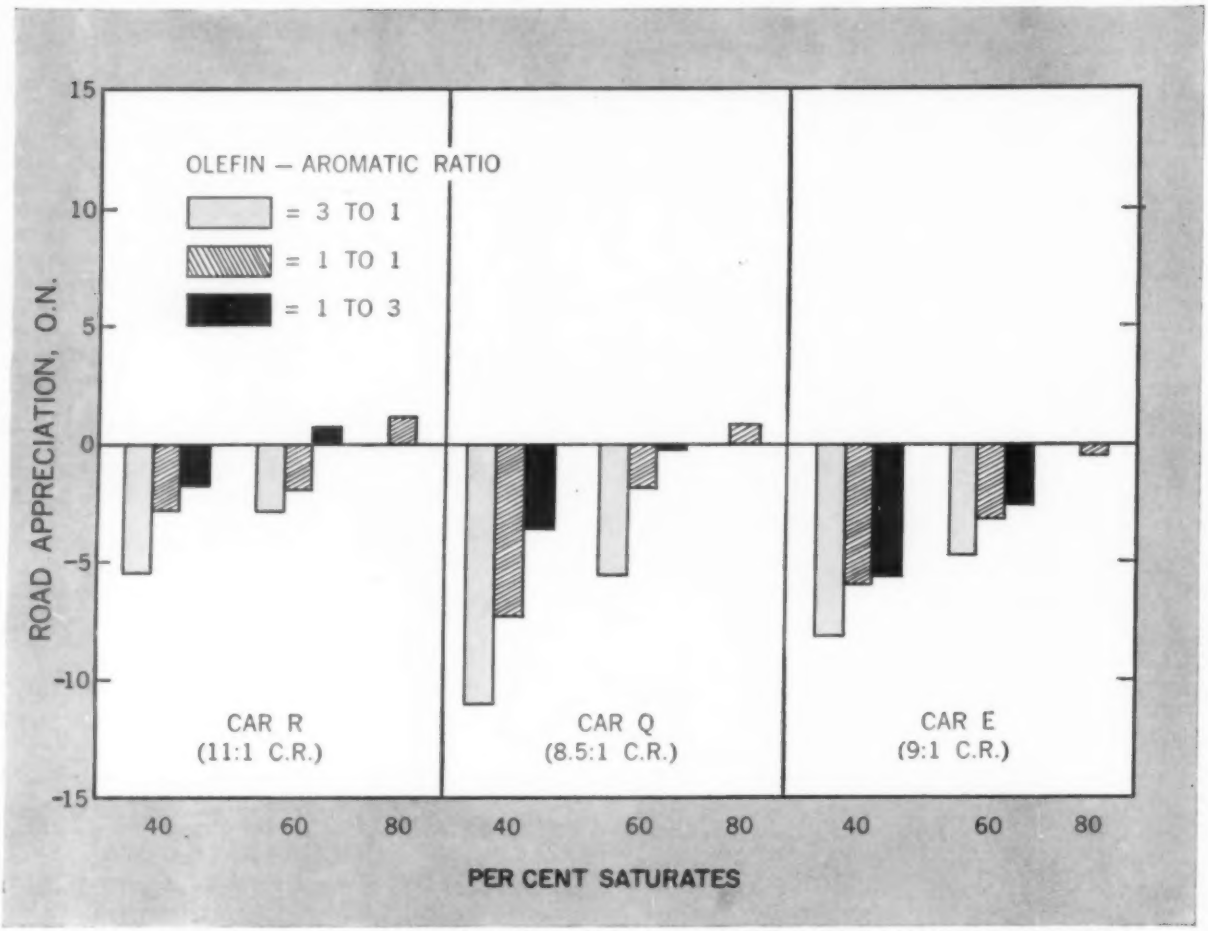
The physical properties of the 5LX46 group would, in all cases, surpass the minimum 5LX52 requirements and actually match the top reported physicals of that group. These records show the physical properties surpass the minimum by as much as 44 per cent. The chemistry again shows two sets of control goals in both carbon and manganese, one range of manganese being entirely under the other.

In the 5LX42 group the carbon control tends to be toward the 22-point range, but the manganese control appears to have three distinct aims: the first about 45 points, the second about 60 points, and the third about 75 points. Analysis of the physical properties show that only about 17 per cent are within the desired range; 58 per cent would well pass for the next higher range; and 25 per cent could easily meet the minimum for the 5LX52 range. The physical properties exceed the required minimum by as much as 52 per cent.

In this review of Tables 1 and 2 it may be noted that a more rigid control of chemical and physical properties not only is possible, but is actually being done by several mills. This type of control is of prime importance to the user and the designer. Design problems are becoming more and more complicated with the advance of pipeline operations over greater distances, more varied country, and greater differences in cli-



RUPTURE in pipe is caused by gouges from paint machine.



Effect of hydrocarbon-type concentration on the road appreciation of leaded blends containing three hydrocarbon-types. Tests at 3000 RPM were made in two 1955 cars of conventional engine compression ratio and in one experimental model of 11-to-1 compression ratio

Ethyl Research Offers Refiners New Benchmark in Rating Gasoline Test Blends

Road Performance Predicted From Laboratory Data

BY F. D. BUERSTETTA, Refinery Technology Division, Ethyl Corporation Research Laboratories

A CONTINUING research program in Ethyl Corporation's Detroit Laboratories has produced new data that will assist refiners in blending their fuels for optimum road performance.

These data are available in a published report entitled, "Road Performance of Ternary C_7-C_8 Hydrocarbon Blends." It is the fifth in a series of progress reports on the program which is aimed at gaining a more thorough understanding of the principles relating gasoline hydrocarbon composition to road antiknock performance.

In this latest report, consideration of the effects of hydrocarbon-type concentration in various blends containing three hydrocarbon types in the C_7-C_8 range at two tetraethyllead concentrations forms the basis for discussion.

Binary Blend Testing Preceded Ternary Blend Studies

All four previous reports were based on the road antiknock behavior of 99 blends, each of which contained two types of pure hydrocarbons in the C_7-C_8 range.

These blends, composed of toluene and diisobutylene separately added to mixtures of isooctane and n-heptane, were extensively tested to find the relationships that exist between road performance and the fuel variables commonly defined by laboratory tests:

Hydrocarbon type and concentration, Research and Motor octane number, and TEL concentration.

An Ethyl Corporation Research team evaluates data obtained in the most recent study of the relationship of fuel variables to road performance.

The program's scope included numerous combinations of hydrocarbon concentration and TEL content at the Research octane levels of 92, 96 and 100, thus permitting several different approaches to the data analysis.

Blends considered in this most recent phase of the program also were of toluene and diisobutylene, representing aromatics and olefins respectively in saturate mixtures of isooctane and n-heptane.

These components were combined to give ternary blends containing 40, 60 and 80% saturate concentration with olefin-to-aromatic ratios of 1-to-3, 1-to-1, and 3-to-1 at each saturate level.

A nominal Research octane number level of 100 was maintained for all blends at TEL concentrations of 0.0 and 3.0 ml per gallon.

In order to provide comparisons with the binary blend studies, road ratings were conducted in the same 1955 passenger cars that were used in previous tests, (nominal compression ratios of 9.0-to-1 and 8.5-to-1).

The blends also were rated in a car having an 11-to-1 compression ratio engine to permit evaluation of performance in engines of the future. All data were interpreted in terms of "road appreciation" to give refiners a better idea of the effectiveness of each blend.

New Tests Confirm Earlier Conclusions

Test results of blends containing three hydrocarbon-types verified the previous conclusions based on binary blend studies — that hydrocarbon-type and concentration, Research and Motor octane number, and TEL level are the most important factors affecting the road performance of gasoline.

Analyses of test data produced these conclusions:

1. The addition of TEL from 0.0 to 3.0 ml per gallon significantly increased road appreciation in all cars over the speed range. This effect is greatest at high engine speed.

2. TEL generally has the greatest effects in fuels containing highest aromatic and saturate percentages.

3. Increasing aromatic content at constant saturate level results in increased road performance of the ternary blends in all cars.

4. With regard to road appreciation, the ternary blends vary—as did the binary blends—according to changing aromatic (or olefin) percentages.

5. Road appreciation is also related qualitatively to fuel sensitivity.

6. The hydrocarbon-type effect is most notable at high engine speeds in all of the test cars.

Results of the long-range program are made available to the refiner as the data are analyzed and reported.

Over-all Research Program Continues

These research findings are but another step forward in Ethyl's continuing effort to aid the refiner in blending fuels and predicting road performance without extensive road testing.

Right now, the long-range program is being carried forward to include all of the hydrocarbons falling within the gasoline boiling range. The results obtained in this important phase of the program will be made available for study by refiners in the near future.

How Ethyl Research is helping you

At today's high octane levels, the art of blending hydrocarbons has taken on ever-increasing importance. As a service to the Petroleum Industry, Ethyl Research launched its long-range hydrocarbon blending program in 1956 to complement the intensive Industry effort being devoted to the problem.

Since the program started, Ethyl has made available four technical reports: "Octane Possibilities with C_7-C_8 Hydrocarbons," "Octanes That Count," "TEL, Hydrocarbons and Road Appreciation," and "Road Performance of C_7-C_8 Blends via Computer Analysis."

Now a fifth report, "Road Performance of Ternary C_7-C_8 Hydrocarbon Blends," is available for your study. Copies of this—and any of the previously issued reports—can be obtained from your Ethyl Representative or by writing Ethyl Corporation, 100 Park Avenue, New York 17, N. Y.

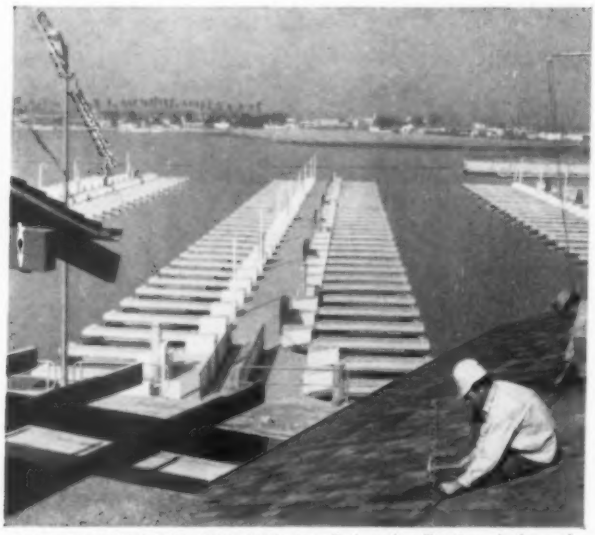
ETHYL CORPORATION
New York 17, N. Y.

ETHYL ANTIKNOCK COMPOUND ETHYL CORPORATION

RESEARCH LABORATORIES:
1600 W. Eight Mile Road, Ferndale 20, Mich.
2600 Cajon Road, San Bernardino, Calif.

ALAMITOS BAY MARINA BASIN #1, built by the City of Long Beach, Calif; S. E. Vickers, city manager; J. D. Gilkerson, city engineer; B. E. McCune, deputy city engineer; Thomas G. Marchese, project engineer. Engineers: Moffatt & Nichol Inc., Long Beach. Electrical contractor: Ets-Hokin & Galvan, Wilmington, Calif. Everdur Conduit furnished by General Electric Supply Company, Long Beach, Calif.

Over two miles of Everdur Conduit guards electric service at new Long Beach, Calif., marina unit, serving 342 boats



EVERDUR ELECTRICAL CONDUIT is installed under floating docks, only inches above the water. Plug-in electrical outlets are located at lockers by each slip and on lighting standards. *Below:* Everdur Electrical Conduit is available in two wall thicknesses—R. C. and E. M. T.

PHOTOS COURTESY INDEPENDENT-PRESS-TELEGRAM, LONG BEACH, CALIF.

The City of Long Beach, Calif., is in the process of transforming its Alamitos Bay area from tide flats and a massive mosquito factory into one of the finest small boat harbors in the world.

The first boat basin and marina unit, which can accommodate 342 boats, is now complete. The floating docks are well lighted and at each slip, boat owners have plug-in electric service and a fresh water tap. All electrical wiring from the shore out is protected by Everdur® Electrical Conduit – well over 11,000 feet, ranging from ½" nominal size to 3". In addition, all fittings and boxes are of Everdur.

Everdur Electrical Conduit – made from one of Anaconda's copper-silicon alloys—never rusts and offers high resistance to other types of corrosion. It provides dependable year-after-year protection wherever water and corrosive atmospheres are a problem – or where conduit must be buried or embedded in concrete. Everdur is also tough – it stands up under movement and vibration.

For detailed information, write: The American Brass Company, Buffalo Division, Buffalo 5, N. Y. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

57136

EVERDUR

ELECTRICAL CONDUIT

an ANACONDA® product

made by The American Brass Company

CORROSION RESISTANT • STRONG • NONMAGNETIC • WORKABLE • WELDABLE

TABLE 3—DIAMETER MEASUREMENTS IN MILL AND FIELD

(36-in. o.d. by 0.406-in. wall pipe)

Pipe No.	Original (a)		Full load in plant (b)		Banded (c)		Full load in field (d)		Final (e)	
	Hor.	Vert.	Hor.	Vert.	Hor.	Vert.	Hor.	Vert.	Hor.	Vert.
1	35½	34¾	35	34¾	35⅜	34⅛	35½	34⅛	35¼	34¾
2	35	35	35	35	34⅞	34¼	34¾	35	34¾	35
3	35⅜	35	35½	34⅛	35	34⅛	35⅜	34⅞	35¼	34⅛
4	34¾	35	35	35⅜	35	35¼	35	35⅛	34¾	35⅛
5	35⅜	34⅞	35⅜	35⅛	35	34⅞	35¼	34¾	35	34⅛
6	35	35	34⅞	35	34¾	35⅜	34¾	35⅜	34⅛	35
7	35	34⅛	35½	34¾	35	34¾			35	35
8	34¾	35	34⅞	35⅜	35	35⅜			34⅞	35
9	35	35	35⅛	34	35⅛	35			35½	34¾

Nominal: 36-in. o.d. by 0.406-in. (i.d. 35.188). Nonimal reading 35. Maximum reading 35 9/32. Minimum reading 35 5/32.

PIPE AND PIPING

matic conditions. Physical properties other than ultimate strength are factors that must be considered and planned for to meet design conditions. Notch behavior is a factor of importance, especially for cold climatic conditions.

Ovality, where it occurs . . . The standard also prescribes manufacturing tolerances on the finished product. The one controlling tolerance, from the standpoint of field construction, is the roundness tolerance. Pipe must be round so the ends may be joined with a minimum of mismatch. Small-diameter pipe is held to a close tolerance by means of a ring-type gage that slips over the end, and by a minimum gage, usually measured by tape or clamp.

Large-diameter pipe is held to the same tolerance but is measured by a "diameter tape"—not across the actual diameter, but around the pipe. If the circumference is within tolerance, the diameter is assumed to be satisfactory; however, a square or oval also has a circumference but no diameter.

Large-diameter pipe frequently has an ovality much greater than desired or intended by the standard. The mills claim that ovality occurs during shipment, that internal expanding devices used in the field can cure this ovality, and that ovality is no problem to the user. Table 3 gives some actual diameter measurements made, comparing loading at the pipe mill with unloading in the field after 1,000 miles of rail travel. This table refutes the first claim.

A review of Table 3 made on a large shipment of 36-in. o.d. pipe with a 0.406-in. wall shows diametric measurements in the vertical and horizontal planes as the pipe was loaded and unloaded. Each measured length was in the bottom tier of an eight-pipe carload. Measurements were taken:

(a) Before any external load was applied.

(b) After the car was fully loaded.

(c) After the steel bands were tightened.

(d) In the field on arrival and after the bands had been cut.

(e) And finally after all pipe, except the bottom tier, had been unloaded.

Inside dimensions were taken at marked points.

It will be noted that no pipe checked had dimensions within the theoretical tolerance. Differences of ¾ in. between the two axes were common. It is interesting to note that six out of nine lengths had a closer tolerance in the final check than in the original check at the mill. There is no doubt that permanent deformation does occur during shipment, but this set is far less than is experienced at the mill.

This table definitely shows that mill tolerances for large diameters is, at best, very lax, except for tape measurements. All pipe used for this tabulation had been checked with a diameter tape and found to be within A.P.I. tolerances so far as circumference was concerned.

Eliminating ovality . . . To eliminate ovality properly, ends of the pipe must be stretched beyond the yield point. No internal lineup clamp can do this. True, some clamps can hold the pipe round until the stringer bead is made, but this locks in stresses, due to the spring-back. As the second bead is made, the heat of welding reduces the holding power of the first bead and a stringer-bead crack occurs.

It also must be realized that not all welds are made with the aid of an expanding-type clamp. Tiein welds are made with an external lineup clamp and this clamp cannot make an oval pipe round. Ovality definitely is a problem in the field—a costly problem. Cracked stringer beads and mismatched or high-low welds are rejected and cut out of the line at considerable expense.

Standards Improvement

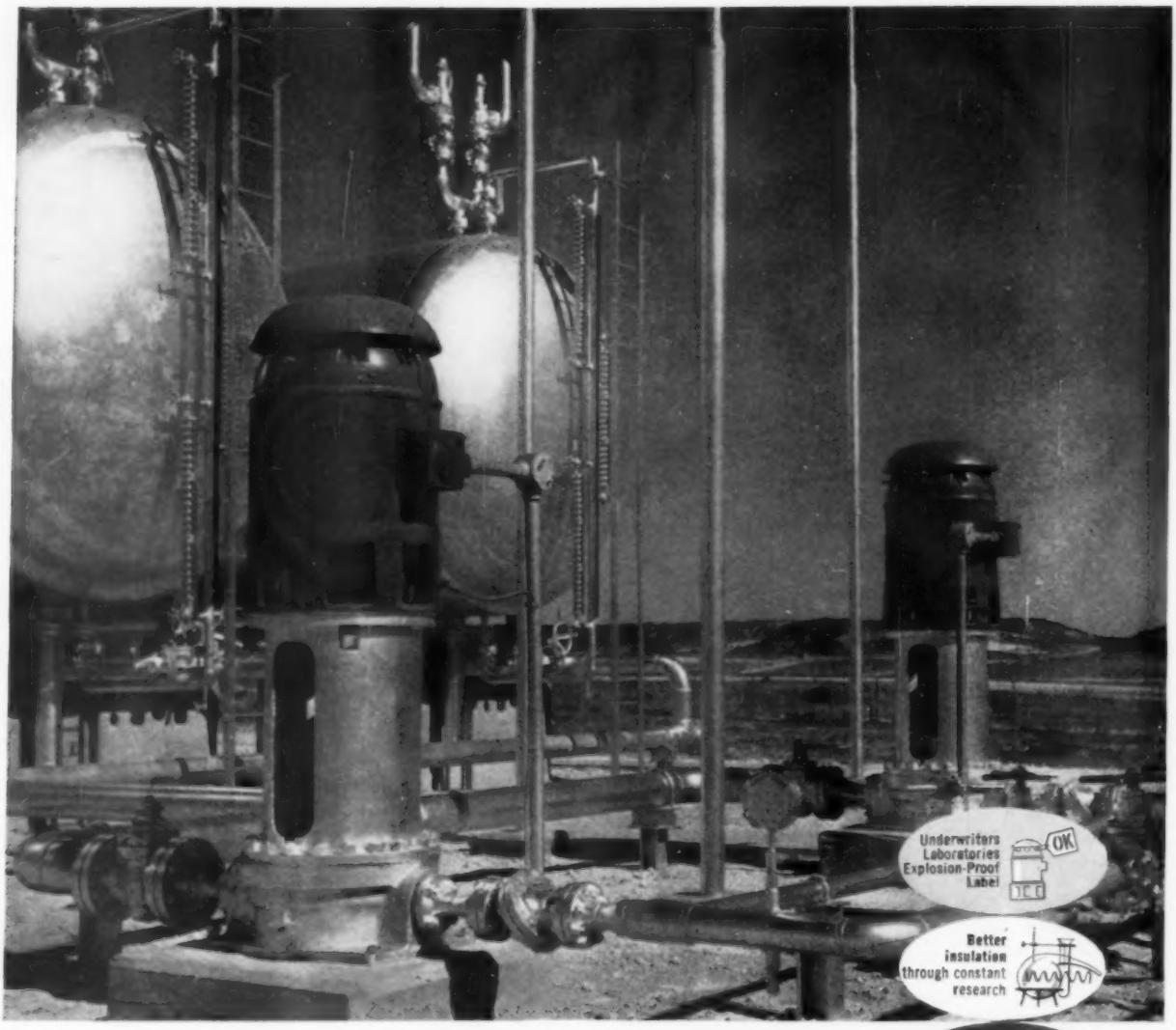
Therefore, the engineer pleads, "Give us the pipe we specify"; the contractor pleads, "Give us pipe we can fit up and weld"; and the fabricator pleads, "Give us a standard we can live with."

The standards are there, but they can be improved. They must be more specific, they must express the intent, they must fulfill the desires and needs of the engineer. If not the engineer must be given true information on what the industry can furnish. The engineer must be sure of obtaining the properties he uses in his design calculations.

At this point, pipe manufacturers are quite likely to say, "Just another complaint that the pipe is at fault where field welding and laying problems have occurred."

Field problems . . . While it is a fact that changes in pipe-manufacturing practices will greatly aid the pipe-laying contractor, this is not a cure-all for field problems. Codes, standards, and specifications outline and control each phase of field work which must be strictly adhered to. We should be well aware of the actual material properties and take them into cognizance during construction.

It is a fact that a pipe failure seldom, if ever, occurs unless there is a "starter" stress point such as a gouge, scratch, weld arc burn, or other surface damage. Careless handling in unloading, stringing, welding, coating, or lowering in may produce that undesirable stress raiser. Poor or worn clamps, chains, or hard slings can cause such damage. Careless welding burns or ground-clamp contacts will also cause such damage. Hardened-steel crawlers on priming and coating machines, cutting knives on cleaning equipment, and chipped steel cradle wheels may cause serious damage—damage which is all the more dangerous because the defect is covered by coating material before it can be discovered.



Here's dependable all-weather power

Louis Allis vertical motors are designed for outside petroleum installations

Here's a pump drive keyed to match the particular specifications of the petroleum industry.

Louis Allis vertical solid-shaft motors are explosion-proof for operation in hazardous locations, and corrosion-resistant to ward off both the etching acids in cat-cracking plants and the corroding action of salt spray at sea-exposed installations.

Tough, impervious insulation plus well-designed fully-enclosed construction give ample protection against weather, including dust- or rain-storms.

These motors are no problem for maintenance men, either. Easily mounted and wired up, they require little care afterwards. Tested quality bearings and ample lubrication reservoir keep them trouble-free. The locked bearing construction assures long life.

Louis Allis has a complete line of Explosion-Proof motors, with speeds to 3600 rpm., and sizes up to 600 hp. Ask for Bulletin 800 at your nearby Louis Allis District Office or write The Louis Allis Co., 449 East Stewart Street, Milwaukee 1, Wisconsin.

LOUIS ALLIS

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

Any lessening in care because of the use of "milder steel" is an open invitation for disaster because of reasons given above. Constant vigilance is an absolute must for safety in pipeline construction and operation. Tolerance limits for allowable surface damage to pipe should be maintained in the field just as well as in the manufacturing plant.

Welding

Welding is a prime procedure of field installation and because of its importance a complete standard has been written to provide the best possible control for this function. Standard welding procedures are developed by welding engineers and are tested both in the laboratories and under actual field conditions to assure sound, workable methods, technique, and a proper joining of materials.

Welders are tested with prescribed materials and technique to ascertain that they can duplicate laboratory results. The importance of these tests is shown by the fact that each welder is tested for each job before he is permitted to start work. Even after he has passed his qualifying tests and starts actual production welding, his welds are regularly examined by means of radiography and an occasional weld is cut out and subjected to physical tests.

The welding standard prescribes close control of welding and also of testing and radiographic examination methods and acceptability. These standards are set up as a minimum and any act or supplemental instruction that tends to liberalize the standards lowers the quality of construction. This is one phase of pipelining that must be enforced.

Weld inspecting . . . To obtain full compliance with the standard, an experienced and qualified welding inspector must be constantly on the job. Occasional inspection or incompetent inspectors are as undesirable as poor or unqualified welders.

Inspection during construction should cover the entire length of the spread. Well-trained men should be used, each familiar with the work and requirements in his particular operation. The responsibility area of each inspector should not be greater than can be adequately serviced. Actual working experience is very helpful, but of greater value is knowledge of the technical aspect of the operation, the requirement of the operational standard as well as the pipe standard and the specifications of the company.

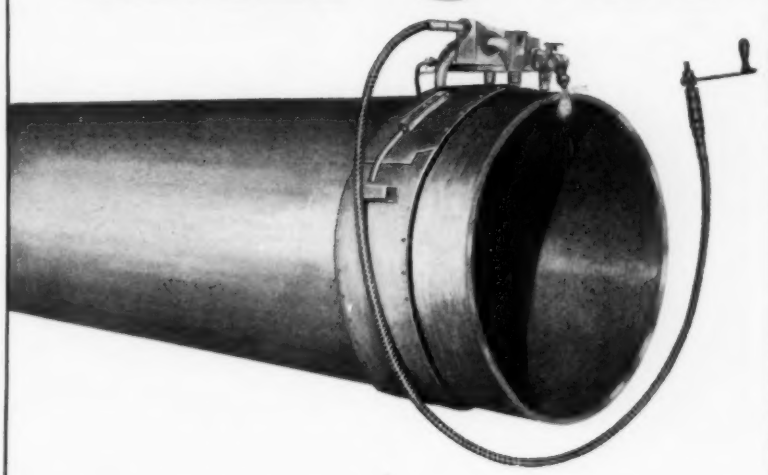
The inspector must remember he is working for the company and not for the contractor. Strict interpretation and application of the standard is demanded and any agreement or compromise contrary to the standard or conflicting with specifications is contrary to the desires of the engineer.

The inspector should be impressed with the fact he is a responsible member of the construction staff and that the safety and quality of workmanship rests on his shoulders.

Welders are the prime craftsmen in field pipeline work and poor workmanship should not be tolerated. Excuses are not acceptable. Regardless of our comments on pipe, it can all be readily welded if proper care and technique are used. The weldability of the pipe should not be questioned because of welding problems which may be created by field conditions.

However, the welder alone is not always to blame for a defective weld. Cleaning of the bevel before welding and interbead cleaning are important contributing factors to clean weld deposits. Poor lineup, improper skid-

BEVELS 6" PIPE
BEVELS 48" PIPE



C-R-C IMCO BEVELERS fit all pipe sizes 6" to 48" O. D., cut perfect bevels, and out-of-round pipe, too. Single lightweight unit does work of several, costs you less to buy and use.

ONE BEVELING KIT FOR ALL YOUR JOBS!

For additional information see page 108, Pipeline Composite Catalog.

The CRC IMCO Pipe Beveling Kit contains a complete range of bands for beveling a variety of pipe sizes. With this convenient selection of sizes, the operator need only make one trip to handle all pipe beveling requirements including back beveling. The sturdy steel case and number of bands are optional.

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HOW WE WORK STEEL TO MAKE STEEL WORK FOR YOU

In the frozen north... Canada's first "BIG INCH"

WESTCOAST TRANSMISSION COMPANY is laying a 30 inch pipeline to tap the prolific gas resources of British Columbia and Alberta. This line runs from these fields due south to the international border. The 688-mile main line marks the first large-scale interchange of natural gas between western Canada's new and expanding fields and U. S. markets. A .O. Smith's Milwaukee mill supplied approximately 22% of the 30-in. pipe used on the project.

Northwest passage...new mileage for world's longest "crude line"

INTERPROVINCIAL PIPE LINE COMPANY has 1774 miles of main line now in service. They are extending this system another 156 miles during 1957. This big crude oil carrier extends from Edmonton, Alberta, to refineries in the Prairie Provinces and Ontario, in Minnesota, Wisconsin, and Michigan. Over 70% of the original line to Superior, Wisconsin, was supplied by A. O. Smith as well as most of the pipe for current and subsequent looping projects.

Want more facts about A. O. Smith products for the petroleum industry? Write today for free, illustrated brochure, "OIL"

Pressure vessels, heat exchangers

Glascote processing equipment

Gasoline dispensers, liquid meters

Today, as always . . .

there's A. O. Smith line pipe in major pipelines like these

Just about 30 years ago, A. O. Smith researchers developed the first truly practical method of mass-producing line pipe. *Result:* Pipelines, as we know them today, became economically feasible.

And A. O. Smith has kept the pace — with painstaking attention to quality in every production phase. This is the reason why A. O. Smith pipe, made and installed as far back as 1928, is still in operation today. This is the reason why you'll find A. O. Smith pipe in so many major high-pressure lines (including the four current projects pictured and described on these pages).

In the arid southwest... a river is pushed aside

To cross New Mexico's San Juan river, **EL PASO NATURAL GAS COMPANY** temporarily diverted the river . . . used dry-land pipelining methods. The new line will supply an additional 350,000,000 cubic feet daily to customers in California and 100,000,000 cubic feet more daily to customers in Arizona, New Mexico, Texas and Nevada. A. O. Smith Corporation of Texas mill supplied approximately 224 miles of 34-in. pipe for the project.

Underwater project..."MUSKRAT LINE" submarines toward completion

TENNESSEE GAS TRANSMISSION COMPANY'S 355-mile pipeline extension is laid underwater four-fifths of its length — traversing swamps and marshland. It will give the Tennessee gas system more than 9500 miles of line in 15 states, with average daily capacity of 1,800,000,000 cu. ft. A. O. Smith supplied the 18 and 20-inch pipe and a portion of the 24-in. pipe for the new extension.

Welding machines, electrodes and accessories

Line pipe, oil well casing

Through research A.O. Smith *. . . a better way*

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NEW ORLEANS 12
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TULSA 3

ding, hammering and movement of the pipe during welding may introduce cracks and other defects.

It must be remembered that internal stresses due to welding frequently are at or near the yield point of the material. Any additional external load, particularly during the cooling stages of the weld metal, may readily cause loading stresses above the ultimate strength of the material with resultant failure.

Weld testing . . . Nondestructive testing, particularly of a radiographic nature, has become a standard practice for examination of welds on high-pressure installations. The welding standard has developed a complete section on the interpretation of defects and has set up rules for the determination of acceptability of such defects. It has taken cognizance of the fact that very few welds are entirely homogeneous and clean and also that all irregularities are not equally harmful.

Each type of defect is judged individually and also in relation to the other types. The limits of acceptability, however, are carefully calculated to prevent a harmful condition to develop. Economic aspects cannot be allowed to lower these limits. Less stringent acceptability limits based on past experience produce a move toward false economy.

A good weld is as economical as a poor weld. The advance of the science of welding eliminates all excuses for inferior quality in welds. Radiography reveals defects and helps to correct welding troubles. However, radiography is not only a tool for quality control but also for correction of defective material. Failure to remove a defective weld will defeat the purpose of such nondestructive testing.

Radiographs are not secrets. Defects thus found should be used by the welding inspector for discussion with the contractor's welding supervisor and welder so that corrective measures can be taken. Welders welcome the opportunity to discuss their work and will attempt to improve if given proper encouragement. Corrective measures should be taken even before rejectable defects occur. The radiographic examination is not just another process in the chain of events. It is vital and should be used to its utmost possibility.

Radiography is only as good as the technique used in making the radiograph. The standard prescribes minimum requirements in radiographic technique and the value of the method is determined by these requirements. An inferior radiograph is as dangerous—and perhaps more so—than no radiograph at all. A poor radiograph, i.e., one that is hard to read—one taken at an improper angle or improperly processed—can easily distort or hide a serious defect such as a crack or fissure. Again proper control is essential.

The standard is very explicit in all of these details and has been written with due consideration to all factors involved and on the basis of vast experiences in all branches of pipelining. As is natural, some of the requirements are not entirely to the liking of all users and some short cuts may be more economical. But the requirements are necessary to secure workmanship of a nature which will give quality necessary for safety within the economy of construction. Sound economy can be based only on the highest quality and safety. All other economy is wasteful.

What Should Be Done

By the pipe manufacturer . . . In summerizing, we find that the pipe now offered by the producer does not entirely conform to the desired qual-

NO PLACE FOR WEAKLINGS

Strong men—rugged machines . . . that's what it takes to keep pipeline construction on schedule.

Pipeliners depend on Lincoln engine-driven welders to run when they're needed at a minimum of maintenance and fuel costs.

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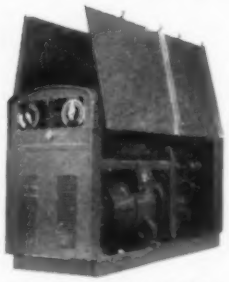

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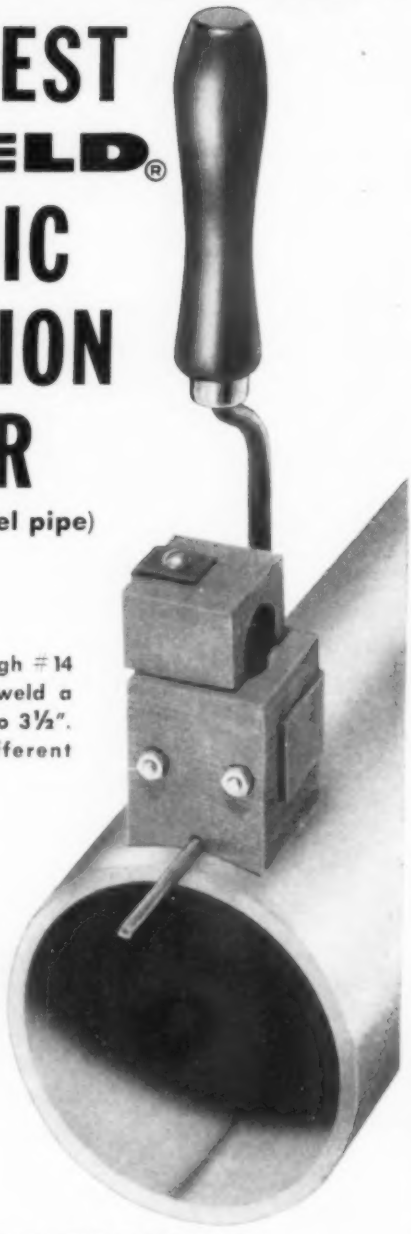

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ity of the user. To achieve this goal the producer should:

- Control chemical properties.
- Control physical properties.
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This can be done within limits intended by the standard as well as those actually written.

By the pipeline company . . . The user on the other hand should:

- Recognize the properties of materials as they actually exist.
- Adjust his construction procedure accordingly.
- Practice close control in all phases of construction.
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- Devote more time to the education of their inspectors so that they will be fully informed of their responsibilities as they apply to the use of construction specifications and the interpretation and evaluation of pipe defects. Good quality pipe can be damaged by the contractor during construction to the extent that it is a potential hazard should it be placed in a pipeline.

Cooperation and recognition of material problems must exist between the user and manufacturer. It should be remembered that a standard is only as good as its interpretation. True economy can be based on sound engineering and highest quality practices. Further, true economy means safety first and cost and speed of completion second. **End.**

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Piping Design for Branch Connections

Here is a practical, comprehensive discussion of this special design situation, including how to restrain or absorb pipe expansion and how to make branch connections.

By James Y. Briggs

BRANCH connections present design problems at three principal types of locations on major pipelines.

These locations—or situations—on a gas system like that of Texas Eastern Transmission Corp. are found at: (1) compressor stations; (2) crossovers at the ends of loop lines; and (3) lateral connections.

Experience in recent years has shown design engineers and operating personnel that special attention to design must be given at these three points. This is because of conditions resulting from the modern use of high-pressure, thin-walled, high-yield pipelines.

In approaching the subject of pipeline design relating to branch connections, it is well to keep in mind that elongation of as much as 1½ ft. per mile of pipe is possible under theoretical conditions.

This discussion will point out the extent to which pipe is naturally restrained under existing conditions of installation. It will specifically discuss measures for restraining or absorbing expansion where needed and describe the practical details of making branch connections.

The pipeline industry, manufacturers, and various research groups with their laboratory equipment and knowledge of stresses have given to the design engineer proof of the magnitude and locations of stresses prevalent when an opening is made in a pipeline; therefore, in each of the major locations previously mentioned, the designer must provide maximum protection for the branch connection by limiting the various internal and external loads.

The internal load, of course, is the pressure which exerts a load normal to the walls of the pipe and creates a thrust. This thrust has been known to have caused movement in pipelines.

The external loads are caused by the unsupported weight of the pipe, settlement of the ground or foundation, expansion due to temperature changes, and poor line-up of the pipe during installation.

This raises the question of how to provide adequate protection. All three major locations in a transmission system certainly cannot economically be treated in the same manner.

Texas Eastern Approach

One solution is to examine the approach made by Texas Eastern. There are probably many different approaches used by other companies based upon their own experience.

At a compressor station, engineers are principally concerned about protecting the connection of the suction, discharge, and bypass lines to the main line.

The first consideration, then, is to satisfy the code for pressure piping by using pipe of the proper wall thickness and following the rules for branch connections. These require the use of forged tees, since the takeoff lines are of the same size and wall thickness as the main line.

Concrete pads placed on firm soil under the tee take care of external loads, such as settlement, and weight of pipe. Good inspection aided by X-ray examination of the weld and providing adequate support of the branch pipe is also helpful in this respect.

Further protection of the branch against expansion of the main line caused by pressure and temperature is required. It is at this point that assumptions have to be made in order to complete the design of protection for the branch. For example, take a 30-in. by ⅜-in., 52,000-psi. pipeline, 1 mile in length, unrestrained, capped at each end and pressured to 935 psi.

At this pressure a longitudinal stress is set up in the pipe wall and a force of 661,000 lb. is created at the ends. By calculating the longitudinal stress, determining the elongation, it is found that the line would lengthen about 3 ft. If a 50° F. increase in temperature of the pipe is assumed, the pipe will expand about 1½ ft. for each mile of line. The actual buried pipeline does not have any elongation approaching these quantities and therefore is considered restrained.

Methods of Restraint

However, knowing these forces are present tending to cause movement, restraint must be provided to insure maximum protection for the branch connections.

Offset . . . One method is to provide an offset of a large radius in the line prior to entering the station yard. The amount of movement it will absorb is not known, but it is reasonable to assume that a certain percentage is absorbed.

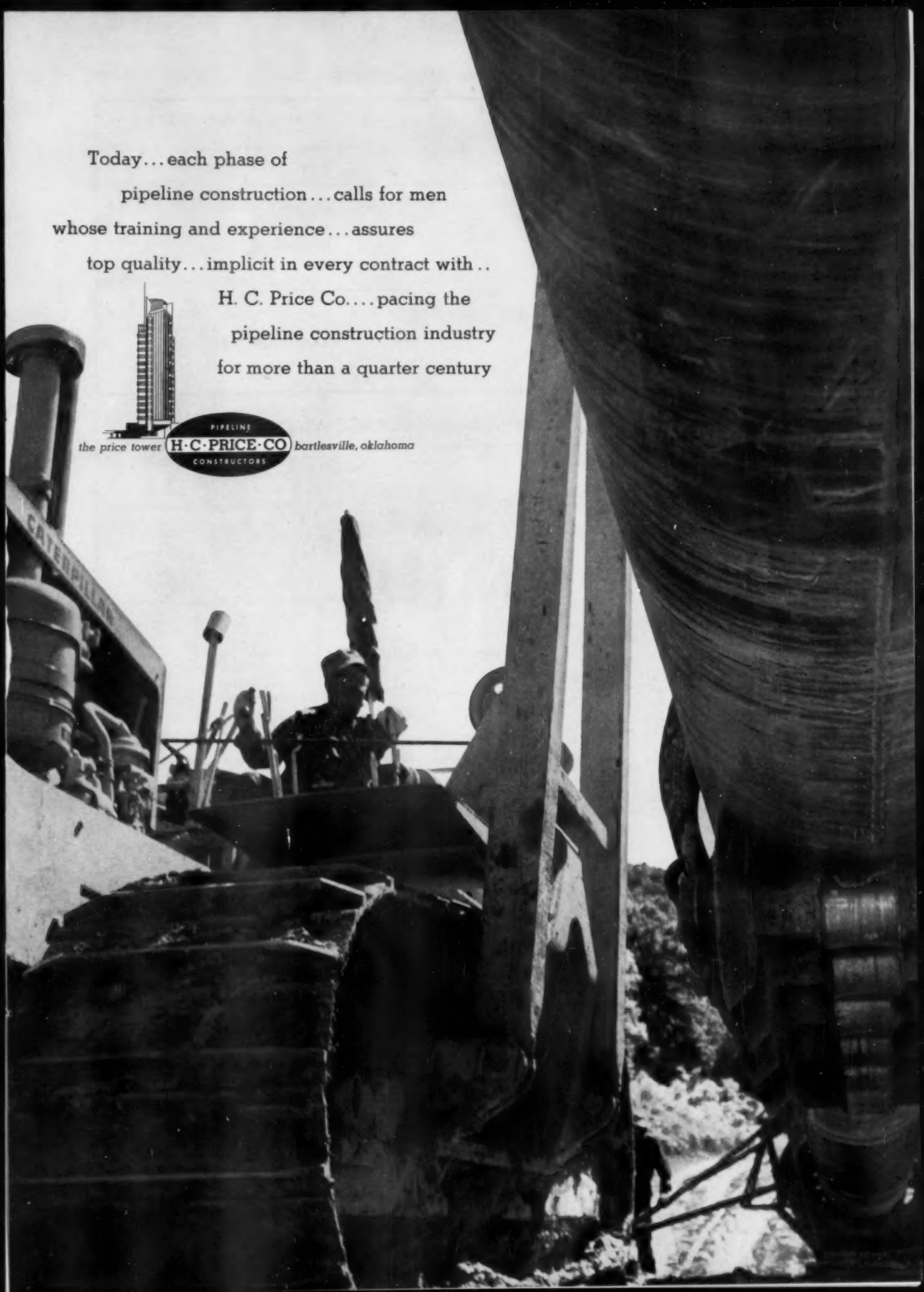
Anchor block . . . Another method is to install a concrete block on the line within 20 to 30 ft. of the branch connection. The design of the block would be based on the maximum calculated forces tending to cause movement. However, there is another problem in connection with the anchor. A way must be found to transfer the forces from the pipe to the anchor block.

In 1953 Texas Eastern engineers and outside consultants worked out a design of a special-steel anchor forging which could be butt welded into the pipeline and embedded in concrete. The forging resembles a pair of weld neck flanges welded face to face but is actually forged monolithic with properly designed bearing surfaces. Today, this forging may be purchased from several sources.

Using an anchor block to absorb the forces and provide protection for the branch connection has proven successful for Texas Eastern. No problems of this type have been experienced in the company's 10-year history.

Texas Eastern is now trying to determine as nearly as possible the magnitude of the forces being absorbed by concrete anchors after installation. Purpose is to improve design.

Expansion loop . . . Another method is to install a U-shaped expansion loop prior to the branch connection.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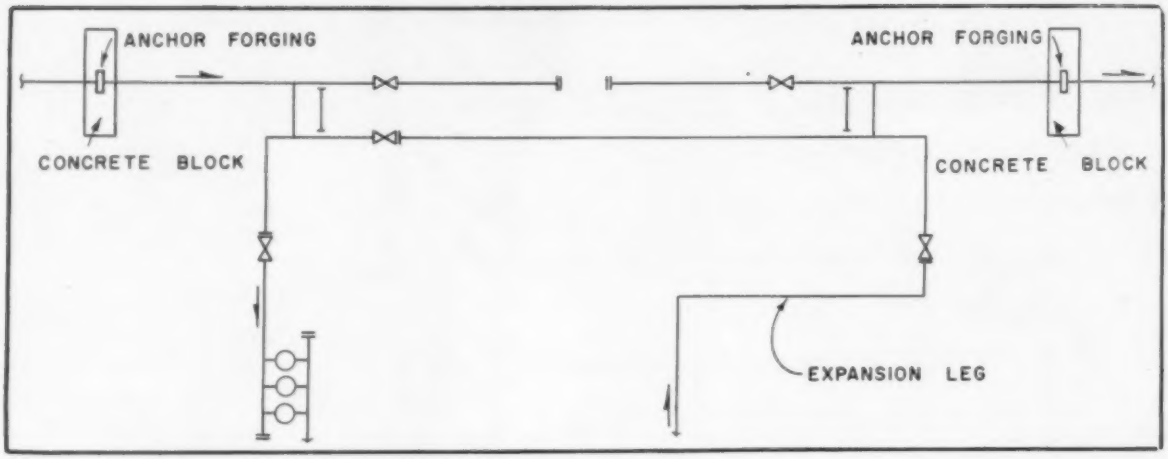
TYPICAL STATION ANCHORAGE



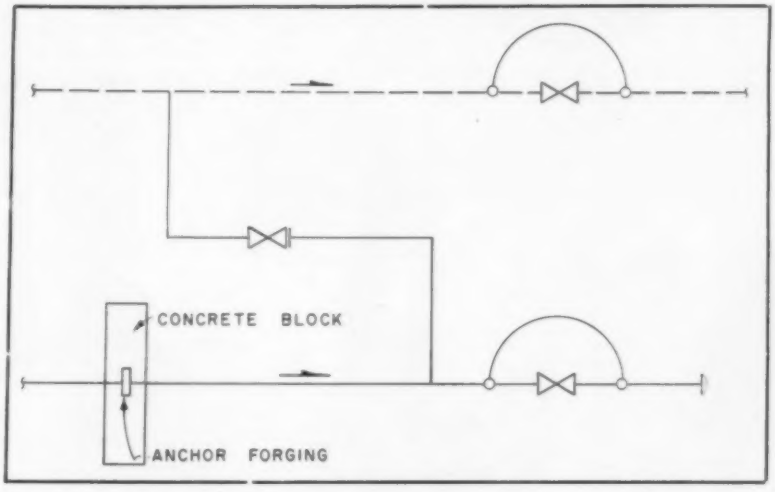
The loop is designed for the maximum movement anticipated. This method is probably the least used, since, for some companies, it prevents the use of scrapers for cleaning on stream.

Texas Eastern practice . . . Texas Eastern's practice is to use the offset in the line combined with the anchor block, which in our case has provided maximum protection to the branch from expansion and contraction.

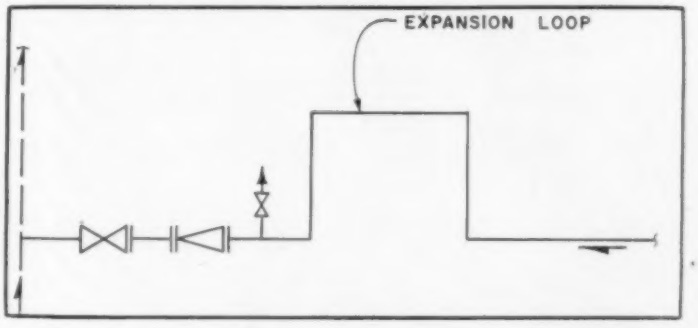
Up to this point, what is considered to be maximum protection has been afforded insofar as expansion occurring in the main line is concerned. The next step is to protect the branch from expansion of the suction and discharge lines which begins at the compressor-station headers and ends at the connection with the line.

In this section of the piping system, expansion loops or offsets are calculated for a set of conditions and built in the line. This portion of Texas Eastern's system is aboveground on piers and strapped in such a manner as to direct the movement into the expansion loop. Do they move? Yes! Expansion has been observed in many locations along Texas Eastern's system. But only in rare instances has any movement been detected beyond the suction and discharge valves. This indicates that the branch connection to the main line has and is being protected from this type of load.

TYPICAL ANCHORAGE AT END OF LOOP



TYPICAL LATERAL-LINE TIE-IN



Examining The Problem

At Texas Eastern, design for the proposed tie-in of 12 30-in. loops along 774 miles of 30-in. by ⅜-in. main line has just been completed. In approaching the problem, the following questions were asked:

- What are the requirements of the code for pressure piping?
- Is there any evidence that the main line has expanded or is going to?
- Should the existing line be an-

THE AUTHOR

James Y. Briggs is project engineer in the pipeline design and construction section of Texas Eastern Transmission Corp. He is a registered professional engineer and was graduated from Louisiana Polytechnic Institute in 1941, with a B.S. degree in mechanical engineering. He was employed by E. I. du Pont de Nemours & Co., and later as a piping engineer on construction with M. W. Kellogg Co.

chored on each side of the proposed branch?

- How much can ground restraint be depended on and what is the magnitude of the force to be considered?
- Should expansion bends be used in the loop line prior to the branch?
- Should the expansion loop be above or belowground?
- Would an anchor on the loop line be sufficient?
- Should provision be made for any expansion in the connecting line?

These are the major questions which came to light and were dealt with in the following manner.

Code requirements . . . The size of the connecting line selected was of the same size as the main line. Therefore the code requires use of smooth contoured forged-steel tees for the branch connection plus the proper lengths of heavy-wall pipe on each side of the tee, complete with transition pieces from the heavy-wall pipe. Although the code does not require it, all of these tie-ins are designed by Texas Eastern as if in Class III locations and under Type C construction. This approach has minimized the effects of internal loading caused either by static or cyclic pressure.

Expansion . . . No movement in the main line has been detected, and since it is anchored at each compressor station, none is expected. This ruled out any idea of placing anchors on either side of the branch in the main line. Therefore, attention was directed to the loop line and its termination.

Restraint . . . The effect of ground restraint is somewhat intangible. For long transmission lines, the friction of the earth will prevent changes in length from longitudinal stresses caused by temperature and pressure, except for the last few hundred feet adjacent to the end of loop. It is at these locations that the movement, if unrestrained, may be of large magnitude.

Expansion loops . . . Expansion loops are usually the first to be considered when faced with expansion problems, for this has been the trend for years. In Texas Eastern's system, this would prevent the running of scrapers, and they were therefore impractical.

If a pipeline is not faced with internal-cleaning operations, expansion loops can be designed to allow for any calculated amount of movements; however, expanion loops present other problems, such as additional right-of-way in some instances and protective fencing if aboveground. If placed under ground some method to allow for freedom of movement would be required. Any combination of these disadvantages can be costly and, in some cases, may be prohibitive.

Anchor block . . . After considering the numerous questions, Texas Eastern decided that the installation of a concrete anchor block a short distance downstream from the branch would afford the necessary restraint for all major pipeline movement. However, one added precaution has been taken, and that is a Z-shaped expansion bend in the connecting line to provide flexibility.

Lateral Connections

The connecting of laterals to an existing main line deserves special consideration for protecting the branch. Generally it is made by choosing one of the approved types of reinforcement, rather than using forged-steel tees, since this type of connection is usually made on a hot line.

The type of reinforcement to be used, such as saddles, pads, Weldolets,

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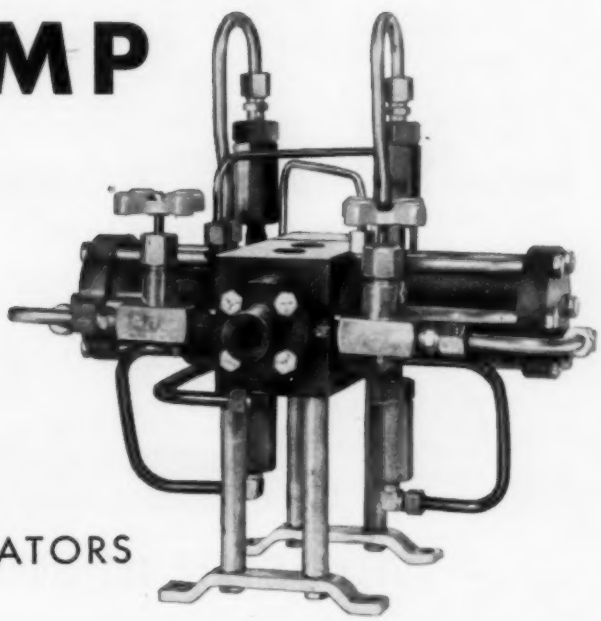

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and sleeves, depends upon several items:

- Size of the header and size of the branch.
- Pressured or nonpressured line.
- Whether header is expanded pipe or Grade B pipe.
- Economics.
- The requirements of A.S.A. code.

Whichever type is chosen for a particular installation based on engineering requirements, protection after its installation should be provided.

Assume that the main line does not move but is restrained by the earth and the anchor blocks located at compressor station sites. Then the problem is to provide for expansion and contraction in the lateral line, and this is particularly important if the lateral originates at a processing plant where temperatures are above normal.

Expansion problem . . . For example, several years ago Texas Eastern installed approximately 17 miles of 8-in. pipe from a processing plant to the main line, complete with aboveground scraper traps. No thought was given to expansion and soon the piers on which the traps were resting took on an angle of about 45° with the ground. Fortunately no break was experienced at the main-line connections; however, it was realized that this type of load had to be considered.

To provide protection on a lateral connection from this type of load, the expansion loop method is, we believe, the most generally use. Texas Eastern's experience has been that this method provides the necessary protection; however, in some instances the anchor block is used, particularly on laterals of sufficient length to require aboveground scraper-trap installations.

Further protection for a connection of this type can be better provided if it occurs in a new line under construction, or if it is economically feasible to shut the line down and install short sections of pretested heavy-wall pipe. However, in many cases lateral connections occur after the main line is in service. It is this hot connection on which the greatest emphasis has been placed, and rightly so, because of the consequences of failure.

There is seldom a month that a hot tap is not required somewhere on the system, varying in sizes 2-in. and larger on lines of various diameters, wall thicknesses, and grades; and each time the basic factors must be considered in choosing the type of reinforcement to use.

Texas Eastern has used saddles, pads, Weldolets, and sleeves; however, on 20, 24, and 30-in. high-yield, cold, expanded lines the size of hot taps has been limited to 2-in., even if it requires multiple taps manifolded together. When multiple taps will not satisfy the condition then arrangements are made to shut down and install a steel forged tee.

Hot-tap drawbacks . . . Certainly it is advantageous to make hot taps wherever possible, because there is no down time. But on the other hand, it has many disadvantages:

- There is always the element of risk with a crew of men exposed, in the event something goes wrong.
- In making fillet welds on high-yield pipe, using the standard welding rods, underbead cracking has been prevalent, therefore necessitating the use of a special rod such as the "low hydrogen" which, in turn, requires special training for the welders.
- Also, when a welder starts to strike his arc on a high-yield thin-wall pipeline, he is fully conscious of the pipe thickness and how long it will take to burn through it. In other words, he is going to treat it tenderly, with the lack of penetration as a result.
- Another disadvantage of a hot tap is you have no way of testing. This may be a minor point to some, but to others it is an important one.

Tee advantages, disadvantages . . . The installation of a manufactured tee is certainly the best design and probably should be used more often than it is, because of the following advantages.

. . . **Eliminates all risk** to the personnel involved.

. . . **Allows full compliance with code,** since it is possible to install the proper wall thicknesses of pipe on each side of the tee with the proper length.

. . . **Complete assembly can be fabricated** beforehand and tested to the proper pressure before the cuts are made on the line.

. . . **Standard welding rods can be used** since only butt-type welds are required, eliminating underbead cracking and poor penetration.

It also has disadvantages, such as the line out of service, and difficulty in getting the proper line-up, particularly in cases where the line moves when cut. **End.**

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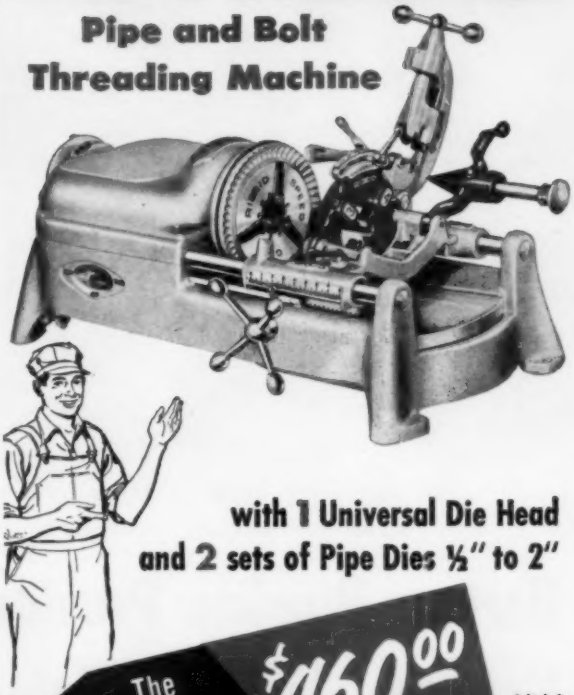

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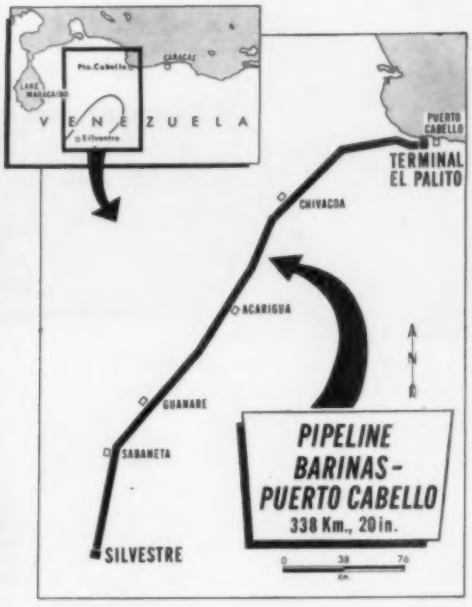

EL PALITO PIER juts 1,800 ft. into sea permitting tanker loading in 40-ft. water. Line extends 211 miles from Silvestre field to Caribbean.

Barinas Pipeline Provides Outlet for Venezuela's Third Major Producing Area

By James G. Smith
Socony Mobil de Venezuela

WITH THE discovery of oil in Silvestre field in 1947, Socony had the problem of selecting a route and building a pipeline from Silvestre to a tanker-loading terminal. There were existing terminals in the Lake Maracaibo region and in the east at Puerto La Cruz.

A line over the Andes Mountains to Lake Maracaibo was not considered because of the ruggedness and height of the mountains. A line east from Silvestre through Las Mercedes field and on to Puerto La Cruz would be over 700 km. long and would require one or more booster stations. The best solution was to head in the most direct route to the ocean and build a terminal in the general area near Puerto Cabello. El Palito, 12 km. west of Puerto Cabello, was selected as the terminal site and in November 1951, property was purchased.

A possible pipeline route between Silvestre and El Palito was the highway right-of-way between these points. If this had been selected, a large percentage of the line would be buried where it passes through cities and towns and at every access road to the highway. In addition this route would be over 450 km. long. It was decided, therefore, to follow as straight a route as possible close enough to the highways to be reached by good access roads and yet causing a minimum amount of inconvenience to landowners because of above-ground pipeline construction.

Since the rivers through the southern portion of the route are quite large and winding, it was necessary to select points of crossing with great care. These crossings largely controlled the location of the line for the first 160 km.

Line route . . . Near Km. 200, there is a 15-km. section of very rough broken country which could have been avoided by passing farther to the east. But again it was felt that it would be better to keep the line as nearly straight as possible. The line then passes on to the valley surrounding San Felipe, staying to the east of the Pan American Highway. At Km. 300, the line approaches the highway nearly touching it at one point, and then parallels the highway to the terminal site in El Palito. The total length of the line is 338 km. The straight-line distance between Silvestre station and El Palito is 316 km.

The profile of the line maintains constant elevation of approximately 130 m. for the first 100 km. and then rises to an elevation of 375 m. at Km. 203. From this point the line has a fairly uniform drop for the remainder of the distance to El Palito.

Right-of-way . . . The first section of right-of-way was purchased in March 1953, and the last portion was purchased in June 1957. Over 60 per cent of the right-of-way is 30 m. wide. The remainder, generally passing through areas under cultivation or through zones which are likely to be urbanized or industrialized within the near future, narrows to 20 m. A very few sections are only 15 m. wide.

Pipe specifications . . . The line is designed for a daily throughput of

DESIGN-CONSTRUCTION

LINE IS LAID aboveground for most of route, according to general practice in Venezuela.

WELDERS on pipe gang apply stringer bead and hot pass. Local laborers were used.

DESIGN-CONSTRUCTION

100,000 bbl. at a maximum operating pressure of 1,200 psi. Forty thousand tons of 20-in. A.P.I. 5LX52, high-test line pipe were ordered for the line, consisting of ⅞, ⅜, and ½-in. wall thickness.

Leaving Silvestre, the line for the first 55½ km. is ⅜-in. wall to withstand the high pump pressures at the station. The next 94½ km. to the future booster station site is ⅞-in. wall pipe. On from this location 33 km. of line is ⅜-in. wall. The remainder of the pipe on into the El Palito terminal is ⅞-in. The ½-in. wall pipe was used at all buried river crossings.

The pipe is supported on concrete blocks, carrying the pipe 12 in. above the ground, with a maximum block spacing of 40 ft. Through swampy ground and at small creeks, H-frame pipe supports were constructed from drill pipe. Over larger rivers and creeks, ranging from 60 to 200 ft. in width, 12 suspension spans were erected.

River crossings . . . At 17 river crossings over 200 ft. in width, the pipeline was buried 2 m. below the deepest point in the channel and carried at this depth the entire width of the river. From the banks the line was raised at the natural sag of the pipe to tie in with the pipeline at ground level. Since the natural sag of the pipe was used to go under these rivers, instead of the conventional sag bends and overbends, the line can easily be lowered should future channel scouring or bank erosion of the rivers require it.

The ½-in.-wall river pipe was coated and wrapped and checked for holidays with a detector. Concrete river weights were installed at 5 m. intervals and designed to give the pipe a negative buoyancy of 1.5 when empty and submerged in the water. Each section of river pipe was tested with water to 1,400 psi. before being pulled in place. Magnesium anodes were installed for cathodic protection at each river crossing.

At all major road crossings the line was coated, buried, and cased with 24 in. pipe. On public and improved roads, the line was coated and buried. For trails, cattle crossings, and little-used private roads, dirt ramps were constructed over the coated-and-wrapped line.

Twenty-five block-gate valves were installed on the line and located near all-weather access roads. A scraper trap is installed at each end of the line.

A back-pressure regulator at El Palito will always keep the line from Km. 200 to El Palito full of oil regardless of the throughput. As the throughput decreases, the valve will throttle back, automatically restricting flow so that at no time will the line tend to void.

Construction

The contract for the construction of the pipeline was awarded in October 1956, and work began the first week of November at Km. 150. There were two reasons for this. The first was that the area near Silvestre was still wet from the previous rainy season. The contractors would have trouble moving in equipment. The second reason was that the ⅞-in. wall pipe was the first to arrive. By starting at Km. 150 at the proposed future booster-station site this pipe could be strung and laid back towards Silvestre without loss of time.

THE AUTHOR

James G. Smith is Western Division pipeline superintendent for Socony Mobil de Venezuela, Caracas. A graduate of Stanford University in 1949 with a B.S. degree in civil engineering he joined Socony Mobil Oil Co., in 1949 in the petroleum-engineering training program, worked with General Petroleum Corp. in California until 1950. He was transferred to Socony Mobil de Venezuela in the petroleum-engineering department in 1950.

Following completion of the petroleum-engineering training program he joined the mechanical and electrical engineering section as an engineer, later being made pipeline foreman in the same section.

In 1954 he returned to the U.S. for a year program working in the Socony pipeline office in New York, and with the Magnolia Pipe Line Co. He returned to Venezuela in 1955 to fill the position of pipeline engineer in the Caracas office. At the same time he was named project engineer for the Silvestre-El Palito pipeline project.

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Pipe laying began on January 9 and was finished on June 19. The average laying rate was 6,900 ft. per day. On the record day, 338 joints were laid, totaling well over 16,000 ft. One of the main obstacles before the rainy season was the extremely heavy dust along the right-of-way. This dust built up to depths over 1 ft., often drowning the motors of ordinary vehicles.

Inspectors were used on all phases of the construction and X-ray machines assisted in checking the welding. A minimum of 30 per cent of the main-line welds were X-rayed and 100 per cent of all river and road-crossing welds were X-rayed. The line will be pressure tested to 1,400 psi. with water before being accepted and placed in use.

Silvestre Station

The elevation at the Silvestre station site is 129 m. above sea level. Because this entire area to the south and west of Barinas is subject to flooding during the rainy season, the highest as well as best-drained location had to be chosen. The tank farm consists of four 150,000-bbl. standard A.P.I. floating-roof tanks, equipped with remote-reading gages and two electric mixers per tank. There are two 16-in. incoming production lines —one from the Socony wells and the other from Sinclair. A 24-in. suction line and an electrically driven 150-hp. booster pump provide suction to the mainline pumps.

Metering . . . A positive-displacement metering installation will measure all oil flowing into the tanks. This metering installation will check the results of hand gaging the tanks versus meters. When the meters are proved accurate, permission will be requested from the government to fiscalize the oil through the meters. The meter installation will be equipped with a wear type of prover tank, continuous samplers, and recording gravitometers. B.s. and w. monitors will sound an alarm should an excessive amount of b.s. and w. appear in the incoming lines.

Pumps, engines . . . The pump station is powered by three V-type, 16-cylinder, turbocharged, dual-fuel engines. They will deliver 2,000 hp. at 1,000 r.p.m. and will use crude oil from the line as fuel. Through speed increasers, these engines will drive two-stage, 12 by 12 centrifugal pumps. The engines, speed increasers, and pumps are skid mounted as one unit. For throughput up to 100,000 bbl. a day, two units will operate in series. When the daily production exceeds this rate, the third unit will be operated in series, and a fourth unit will be installed as standby. Two similar units will then be required at the booster station to provide a station discharge pressure of 1,000 psi. with a third unit as standby. The system could then very easily handle 150,000 bbl. per day.

Controls . . . Automatic controls and safety devices, as well as electric-motor-operated valves, will be installed throughout the station. The center of the control system is a vertical console built into a wall of the control room, having a schematic layout of the station with switches and operation indication lights for tank mixers, booster pump, motor-operated valves, and roof ventilators. Storage-tank levels and engine speeds will be indicated by gages on the console panel.

There will be automatic controllers and recorders for station discharge pressure, station suction pressure, and station flow. Warning lights, and audible alarms will signal in event of:

- High station discharge pressure.
- Low station suction pressure.
- Station flow not within desired range.
- High engine speed.
- High pump-bearing temperature.
- High pump-case temperature.
- Pump-seal failure.
- High sump level.
- Instrument-air failure.
- B.s. and w. content above limit.

A water-spray and foam fire-control system with manual as well as automatic controls will be installed in the station. Fire-hose connections will be placed at strategic locations through the station and tank-farm areas.

An electric-generating system composed of two dual-fuel engines identical to those used with the pumps mounted with 1,500-kw./4,160-volt electrical generators, will supply the station, tank farm, and the producing fields with electricity. These units are located at the opposite end of the station building from the pumping units.

El Palito Terminal

Tankage . . . Because it's more desirable to load tankers by gravity than by pumping, a tank site was selected on one of the hills near Punta Chavez, and designed to accommodate five 267,500-bbl. A.P.I. floating-roof tanks. Four of these tanks will be at an elevation of 80 m. above sea level and the fifth will be at 75 m. The earthwork required to prepare this tank site totaled over 250,000 cu. m. Firewalls, 2 m. in height, exist on three sides of each tank. The west side is left open to allow any spillage to run off and be trapped by dams located across the valley adjacent to the tank site.

These tanks will have remote-reading gages and electric tank mixers. The main pipeline will be connected to the tankage with a 20-in. filling line. The single lines connecting the tanks to the 20-in. filling and the 30-in. loading-line headers will be 24-in., and all valving will be electric-motor operated.

Pier . . . The pier was constructed taking advantage of the shallow reefs to the north of Punta Chavez, and extends for nearly 1,800 ft. in a direction N 8° E, with the last 450 ft. of pier swinging around 38° to the right and heading due northeast. This permits tankers to dock heading directly into the prevailing winds on either side of the loading platform in water over 40 ft. deep. The first 1,000 ft. is rock causeway and the remainder of the pier is constructed on 12-in. pipe pile bents driven vertically into the ocean floor.

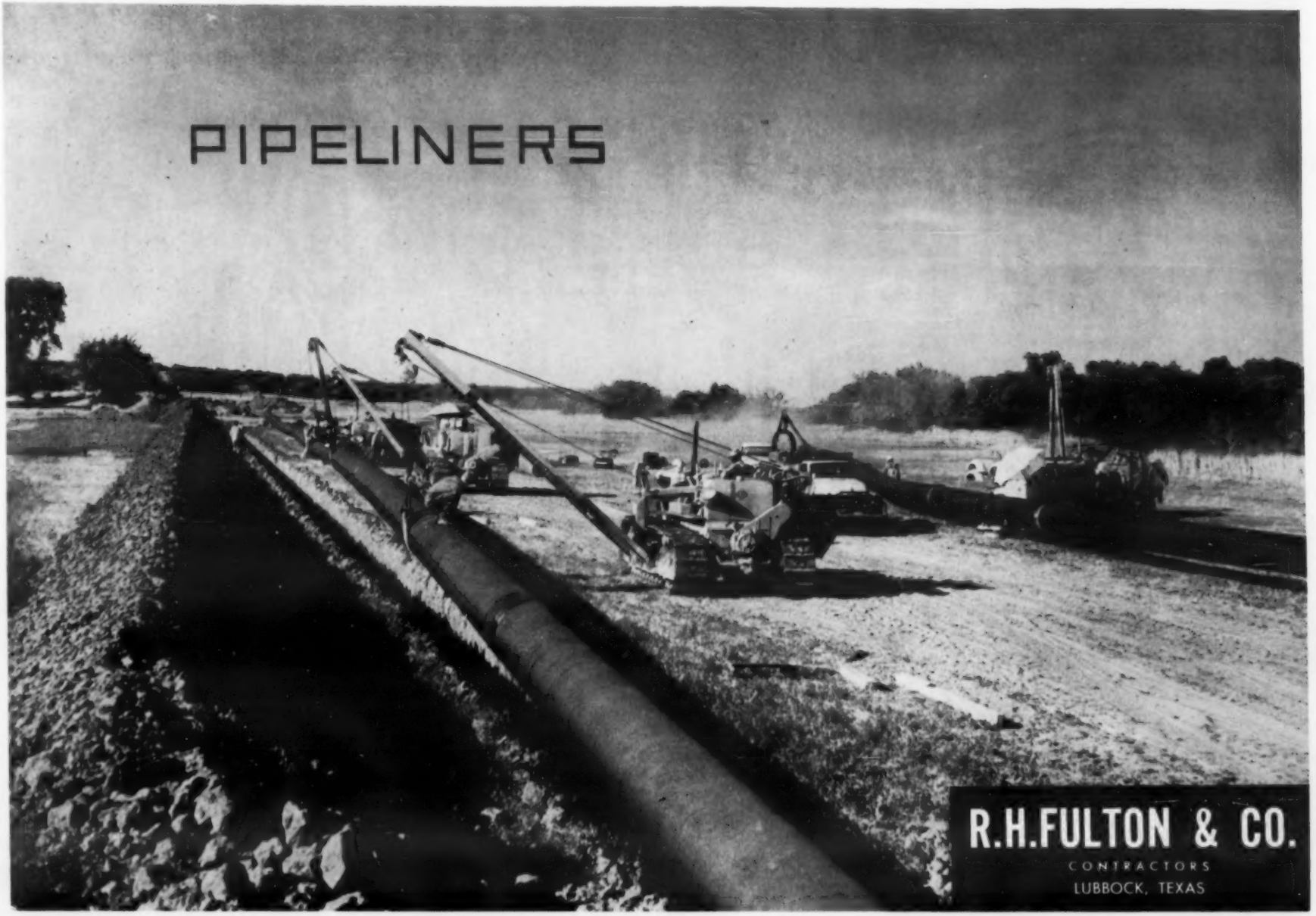
Loading line . . . The loading line consists of 5,000 ft. of 30-in. pipe extending from the tanks to the shore line, where it is reduced to 24-in. and continues to the loading platform. On the loading platform there will be three 8-in. hoses controlled by electric winches extending on either side. The maximum loading rate is expected to be 30,000 bbl. per hour. Later should loading requirements dictate, two more hoses per side can be added and all hoses increased to 10-in. diameter. Provisions are also made for installing a second loading line from the tanks to the loading platform, should later conditions warrant it

A ballast line of 20-in. concrete-lined steel pipe will extend from the loading platform to the shore and to the 100,000-bbl. ballast pit.

Fire protection, communications . . . A fire-protection system will provide complete water-fog coverage of the loading platform and the outermost 350 ft. of the pier. In addition, fire hydrants and hoses will be located along the pier and throughout the tank farm.

A radio network provides communication between Silvestre pump station and the El Palito terminal, as well as any mobile pipeline units that might be located along the line.

The project, estimated to cost $26,000,000, is a joint venture of Socony Mobil Oil Co. de Venezuela and Sinclair Oil & Refining Co. Socony has supervised the construction, and will operate the system. **End.**


PIPELINERS
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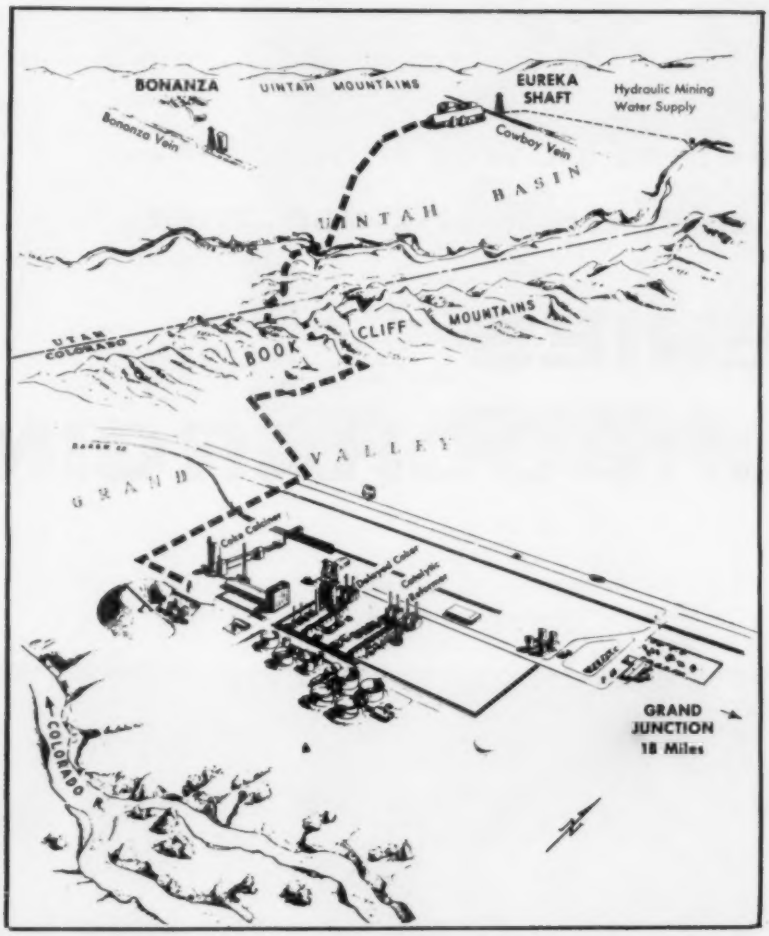


GILSONITE ORE is mined in Uintah basin of Utah, piped in a slurry over the Book Cliff Mountains to the south, and refined into gasoline and coke near Grand Junction, Colo.

Pipelines Carry Solids, Too—

Gilsonite for Instance

This one moves 700 tons per day

By D. H. Stormont
District Editor

SOLID MATERIALS can be transported economically through a pipeline over mountainous terrain. This is being proved by a new 72-mile line on the Utah-Colorado border.

A 6-in. line of American Gilsonite Co. is moving a slurry of gilsonite from mines at Bonanza, Utah, to its new refinery near Grand Junction, Colo. About 700 tons of the crushed ore is being moved daily. Route of the line is through mountainous country; in crossing 8,500-ft. Baxter Pass the $2,000,000 line rises 2,000 ft. in 6 miles.

At Grand Junction the crushed ore is melted and charged to a unique refinery where it is changed into high-octane gasoline and high-purity metallurgical coke. By means of a delayed coker and a two stage Platformer, 700 tons daily (630 tons per calendar day) of the asphaltlike material are converted into 1,300 bbl. of gasoline and 275 tons of coke.

Operating costs for the 72 mile haul are about $1 per ton. Since the ore contains about 5.6 bbl. of oil per ton, the cost is about 18 cents per barrel at present throughput rates.

American Gilsonite estimates it has a 16,000,000-ton reserve of ore, equal to almost 100,000,000 bbl. of oil, at its holdings in the Unitah basin. The ore occurs in vertical veins up to 22 ft. wide, extending as deep as 2,000 ft., and running along the surface for distances as much as 9 miles.

As dust from the solid hydrocarbon is highly explosive, the ore is mined by two radically different methods. One is a form of hydraulic mining. The other uses a long drill, with the ore constantly kept wet. In either case the water used to cut the ore also washes it to sumps where the ore is crushed before being pumped to the surface.

Preparing the slurry . . . The mixture of ore and water as it comes from the mine is pumped to a slurry-preparation plant. There the ore is crushed, fine sand removed, and the water-ore ratio adjusted to pipeline requirements. Only particles of less than ⅛-in. are separated for shipment in the line.

After passing along a dewatering screen, the ore is continuously weighed before being fed into a series of desanding tanks. There it is mixed with the proper amount of water to produce a slurry consisting of 35 per cent solids and 65 per cent water.

The slurry is retained in a 5,000-bbl. storage tank for 12 hours prior to entering the line. During this time it is continuously agitated, and tests run to assure the solids-to-water ratio is correct. The line is supplied from a second tank while one tank is being prepared for shipment.

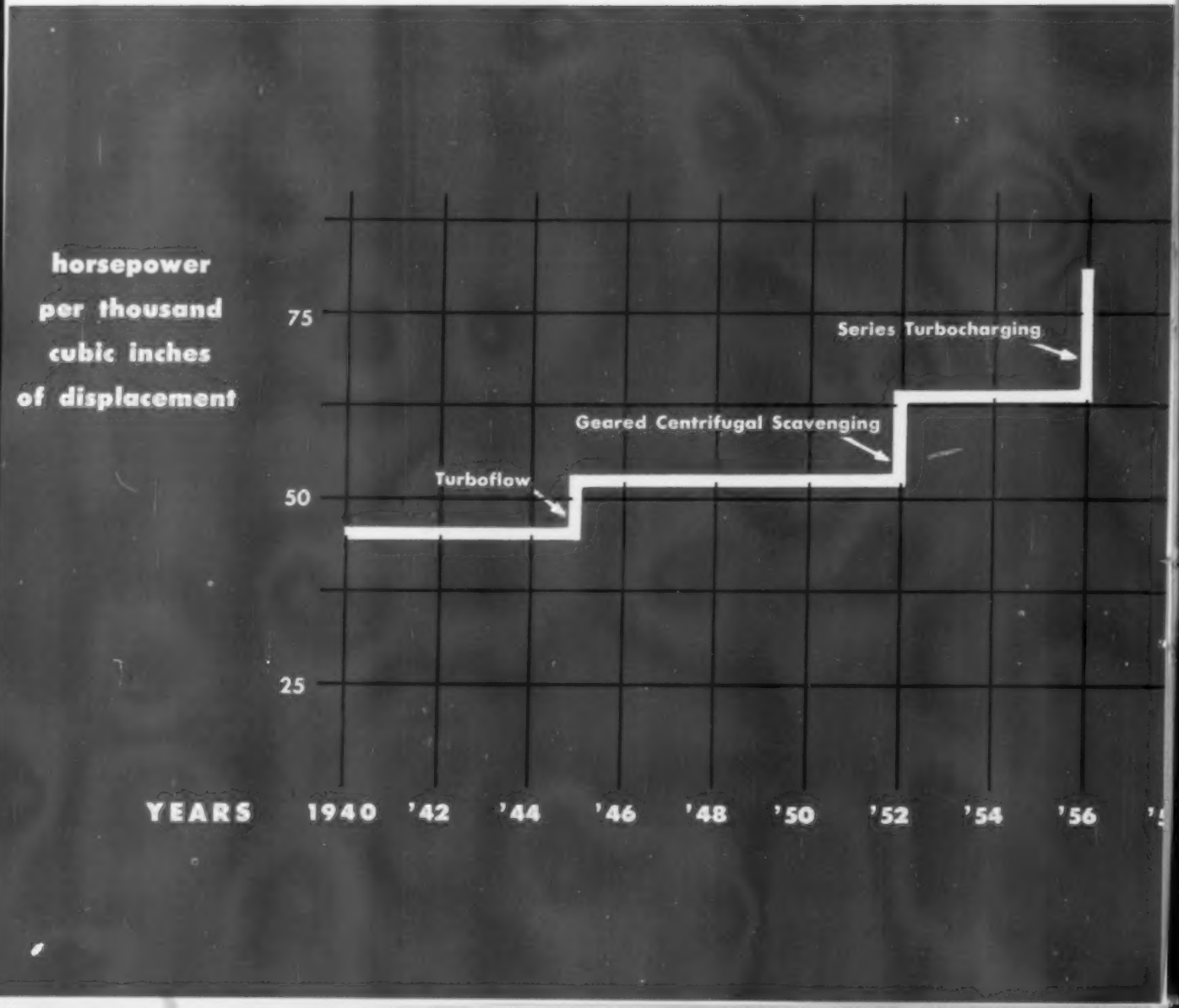
Pump station . . . The pump station consists of three reciprocating, outside-packed plunger pumps driven by 300-hp. electric motors. One serves as a standby while two operate. These supply the line at a rate of approximately 350 g.p.m. at a discharge pressure of 2,100 psi. This results in line velocities of about 4 ft. per second and a minimum pressure of 200 psi.

Previous experience with gilsonite showed that small particles would settle out on downgrades unless the line was kept under pressure for its entire length. It is not sufficient to pump the slurry over 8,500-ft. Baxter Sum-

another power increase . . .

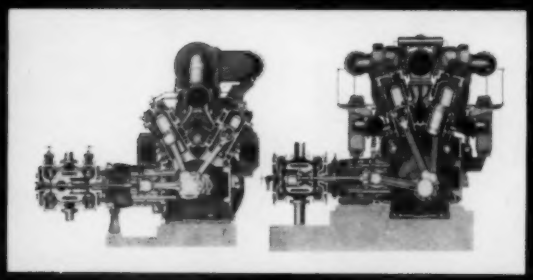
40% more! . . . with Cooper-Bessemer

SERIES TURBOCHARGING



Cross section of Series Turbocharged GMVC V-Angle compressor 720 to 1800 bhp.

Cross section of Series Turbocharged GMWC V-Angle compressor 2000 to 3500 bhp.



The graph opposite tells a story of Cooper-Bessemer developments during recent years that have boosted compressor engine output substantially and thereby saved users countless dollars. Series Turbocharging is the *most recent* . . . and *most significant* in terms of direct advantages and economies.

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SLURRY STARTS on 72-mile trip through 6-in. line at Bonanza pump station, which pumps 350 g.p.m. at 2,100 psi. discharge...

AND ARRIVES at Grand Junction refinery where it is dewatered before processing. A 7,000-ton backlog of ore in background is insurance against line shutdown.

mit, highest point on the line, and then let it gravitate to the refinery.

To accomplish this, a back pressure of 1,150 psi. is maintained on the discharge at the refinery. To control the back pressure, flow is directed through a group of small diameter lines—some only 1-in. diameter. These are connected in or out of the system as the pressure drop requires.

Design of line . . . The pipeline operates continuously and will be shut down only after all the slurry has been flushed from the line with water. Several precautionary measures were taken to guard against plugging, and for flushing the line in an emergency. Even more thought was given to its design, however.

The company had had some experience handling gilsonite slurry through a 1-mile gravity line at Bonanza. This line, however, had to be designed to transport slurry over 72 miles of the most rugged mountain terrain in the country. There was no precedent for this type of line.

As gilsonite has a density of about 1.3, finely ground particles can be kept in suspension as long as the slurry is kept agitated. Other factors, such as friction loss, flow velocities, erosion rates, and slurry concentration, had to be determined before the line could be built, however.

Accordingly a study was undertaken at the Colorado School of Mines Research Foundation, Inc., located in Golden. A 500-ft. loop of 6-in. line was constructed and gilsonite slurry pumped through it. Pumping tests were also made to determine the types of pistons, valves, seats, etc., which would give the best service. The entire program took 6 months.

Regarding particle size, it was found that ¼-in. particles could be pumped with conventional, positive-displacement pumps. But performance was greatly improved when the particles were kept to less than eight mesh.

Through keeping the particles small it also was found that:

- Less degradation or particle breakdown occurred during transit.
- Dewatering was made easier.
- And particles remained in suspension better.

Erosion and corrosion were studied by installing a radioactive section of pipe in the test loop. By careful measuring the minute amounts of radioactive material worn away by the slurry, erosion rates were established in a few hours. They were found to be negligible. By removing free oxygen from the slurry through a sodium sulfite treatment, corrosion was almost eliminated.

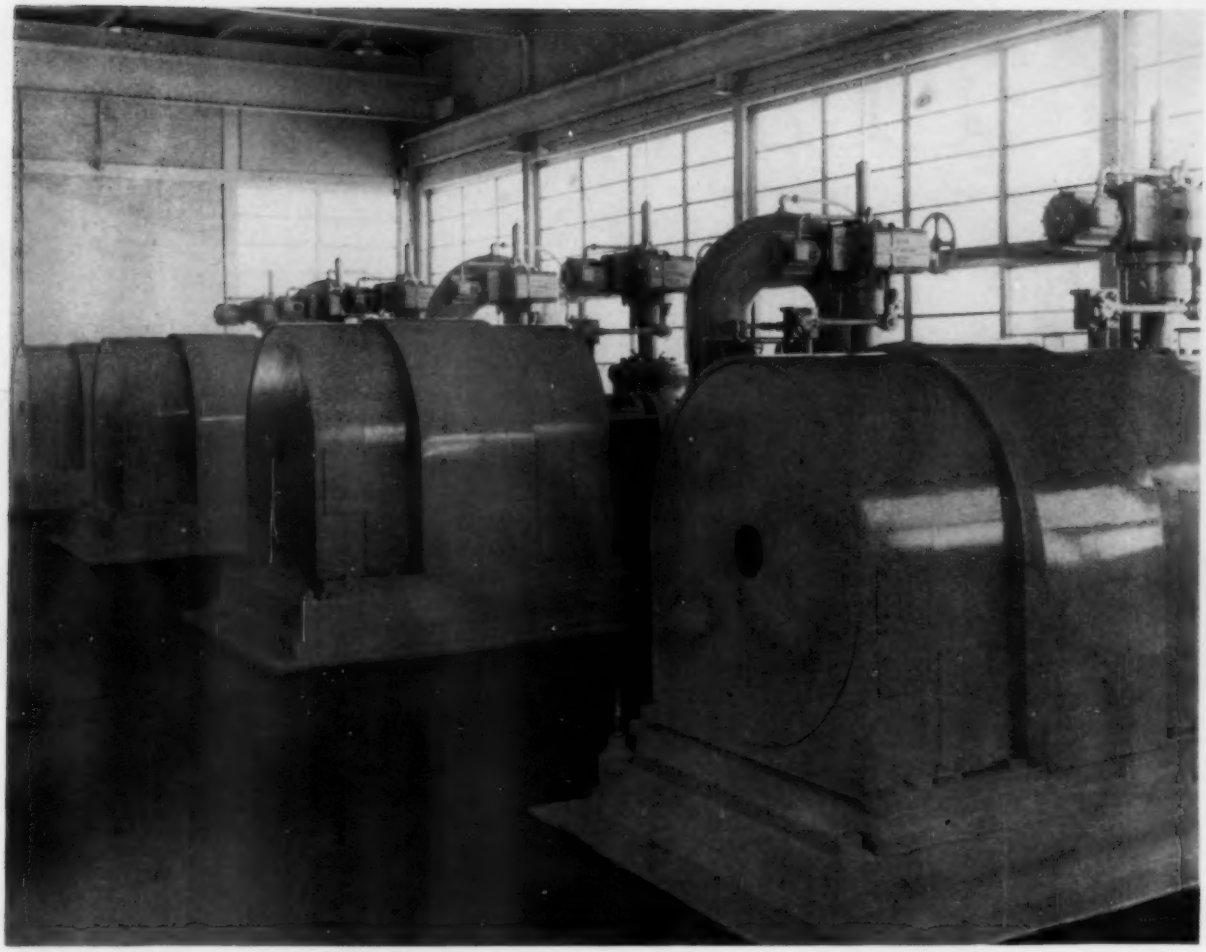
As to the percentage solids which could be handled, it was found that slurries containing up to 41 per cent solids could be successfully shipped without plugging. This high percentage has not been attempted in the pipeline, however. Maximum so far tried has been 38 per cent. The percentage will be stepped up during coming months until rising input pressures indicate there is danger of the line being plugged.

R.O.W. safeguards . . . Right-of-way of the line for the most part follows the roadbed of an abandoned railroad. This permitted it to be laid at a fairly uniform slope. In crossing the Book Cliff Mountains, however, it rises 3,500 ft. in less than 40 miles. In dropping from Baxter Pass, 21° slopes were necessary. A 700-ft. suspension bridge was built to span the White River.

Under present conditions of operation, the line is transporting 700 tons of ore daily. By stepping up the percentage solids to 40 per cent, if this proves possible, 800 tons daily could be moved. Adding a second station would permit about 1,000 tons to be shipped daily at a 35-65 per cent ratio.

Precautionary measures taken to prevent the line from being plugged include a water reservoir at the summit of Baxter Pass. This can be used to flush the line in both directions. There also is a high-pressure pump at the refinery for back-flushing the line.

In the event of power failure at the pump station, a diesel-driven pump normally used to provide high pressure water for ore cutting automatically takes over the line load. It would flush all ore from the line before any shutdown. Experience is showing that so long as adequate velocities are maintained there is no buildup of solids. **End.**



A bank of motors in a pipe line station in West Texas. Another example of the clean, compact, efficient installations possible with Utility Electric Power.

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Sub-assemblies in place, forming tank wall.

Tractor cranes speed handling of steel.

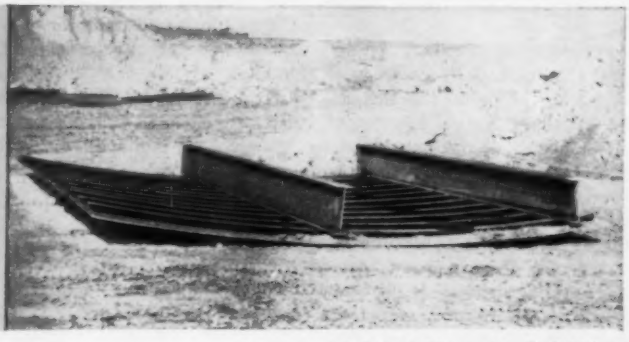
Detail of interior bracing and roof supports.

Reinforcing steel in place for concrete slab over tank roof.

Typical liquid fuel storage unit at completion, ready for earth cover.

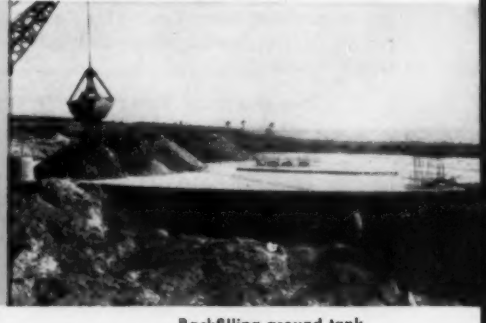
7,500 *to* 80,000 *barrels in capacity*

Foundation and bottom plates in place.



Sub-assembly, made with field jigs. Plates reinforced with shop-welded T's.

Pouring concrete over roof, from buggy platforms.



Backfilling around tank and placing earth fill over roof.

PITTSBURGH-DES MOINES STEEL CO.

Before Adding Generators . . .

✓ check your power factor

Panhandle did, and found answer to its problems in capacitors

By H. A. Larberg
Engineer, Panhandle Eastern Pipe Line Co.

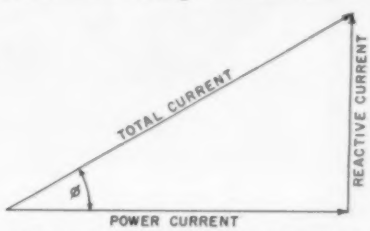
THE POWER-GENERATING and power-distribution companies have long been aware of the necessity of maintaining their system power factor as close to unity as possible. Companies owning and operating relatively small generators for their own power consumption often neglect the loss of energy suffered by operating their systems at a low power factor. The usual remedy when expansion of the electrical load indicated a need for more generating capacity was to install additional units. Many times improvement of power factor would eliminate this need.

Several months ago Panhandle Eastern Pipe Line Co. was faced with such a problem. Due to the installation of additional electrical equipment, the auxiliary units at the Montezuma compressor station approached maximum load on the prime movers, although the generator windings were not fully loaded. This condition left little flexibility in operation and caused concern regarding the loss of the complete compressor station if one of the auxiliaries was to break down. Panhandle Eastern decided to investigate power-factor conditions at this station and also the possibility of taking corrective measures. This is a report of the investigation and subsequent action.

Power Factor Theory

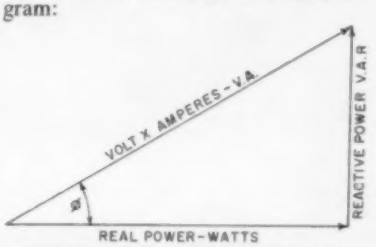
A brief review of the theory concerning "power factor" recalls that alternating current either leads or lags the voltage in any reactive electrical load. (This is not true when dealing with direct current.) When the power factor is leading, the current arrives at its maximum value before the voltage reaches its maximum value by a certain period of time. Likewise, a lagging power factor means the voltage arrives first at any point on the sine curve. The period of time is measured in electrical degrees. The cosine of this angle is called the power factor. When the voltage and current are in phase, the angle between them is zero, cosine of zero equaling 1.00 and the power factor then equaling 1.00.

An inductive load will cause the current to lag and a capacitive load will cause it to lead. The algebraic sum of capacitive reactance and inductive reactance of all the loads on a generator governs the power factor. For any given system the current is the limiting factor, and all reactive loads have two components—power current and reactive current. The total current is the vector sum of these two components, as shown in the vector diagram, where ϕ is the angle between the voltage and current:



CURRENT VECTOR DIAGRAM

Since the voltage remains constant and power is the product of voltage and current, the power or energy required for any load is a total of reactive and real components also. This is shown by the power vector diagram:



POWER VECTOR DIAGRAM

Real power or watts (sometimes called useful power) is the only electrical energy that can be put to useful work. It is desirable to keep the volt-amp. equal to watts as near as possible since power factor is also equal to the ratio between volt-amp. and watts. The difference between the two is energy that is lost in heat.

$$\text{P.F.} = \frac{\text{Watts}}{\text{Volts} \times \text{amp.}}$$

Montezuma Facilities Studied

A study of the existing facilities and load at Montezuma compressor station revealed the generators were operating at an average power factor of 78 per cent. Since power factor equal watts ÷ volts × amp., the generators were producing approximately 20 per cent more energy than was being put to useful work. Correcting the power factor could increase the bus-bar capacity some 20 per cent, while installing an additional generator of equal size to the existing four units would increase the capacity only 25 per cent.

Daily load conditions were studied with respect to the electrical power generated, power consumed, and voltage regulation. Readings were taken every hour, day by day. These values then were plotted to determine the average power factor and average energy consumed. Average conditions were used because of the wide fluctuation in load conditions.

Figs. 1, 2, 3, and 4 show a plot of these figures for a typical day. The solid lines are actual measured values, and the dashed lines indicate what the various values would be after corrective measures had been taken. A check was made to determine if the power factor was leading or lagging (majority of all industrial loads have a lagging power factor). It was necessary to de-

DAILY POWER LOADS AT MONTEZUMA STATION

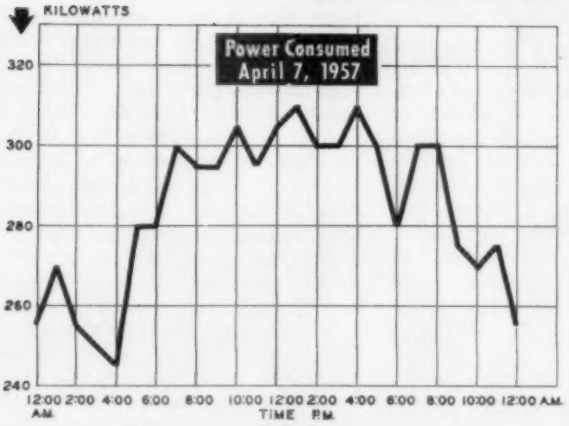


FIG. 1

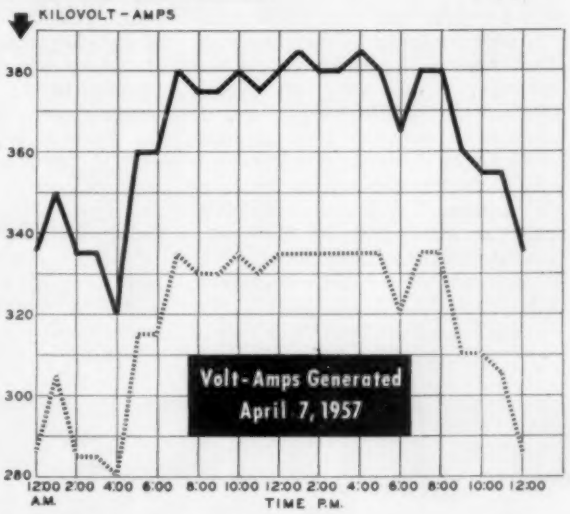


FIG. 2.

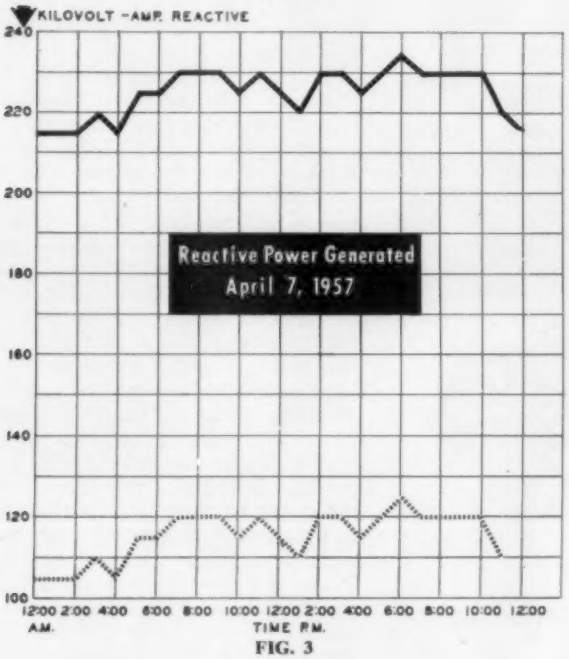


FIG. 3

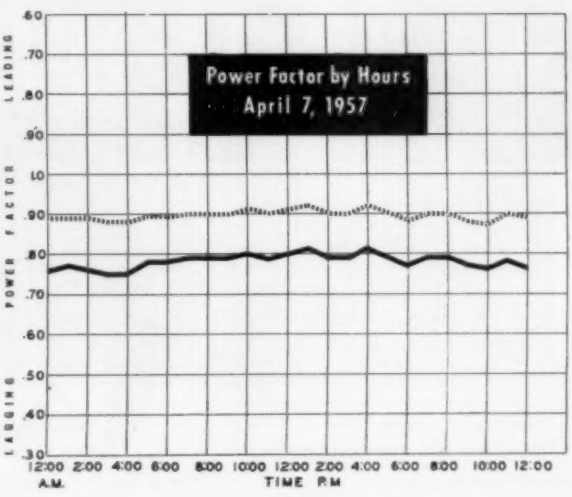


FIG. 4

termine these conditions before the amount and means of correction could be concluded:

Average power generated, 325 kva.

Average power used, 250 kw.

Average power factor, 0.78 (lagging).

Correcting the Power Factor

The load, and only the load, connected to a generating system governs the power factor, and the only way to correct power factor is to alter the load. This can be done by adding load or replacing some of the existing load.

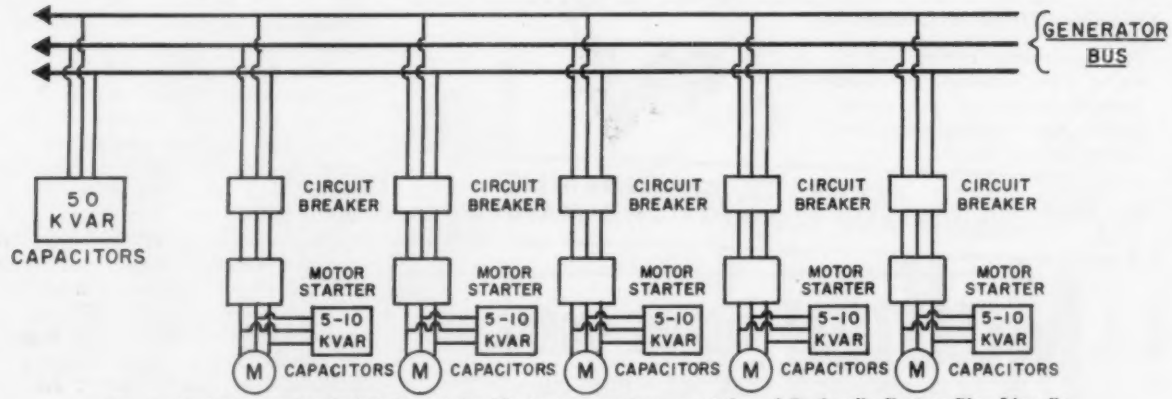


Fig. 5—Typical capacitor installation at the Montezuma compressor station of Panhandle Eastern Pipe Line Co.

Since the power factor at Montezuma was a lagging one, only three methods were available for its correction. They were: (1) replacing the existing induction motors with synchronous motors, (2) installing capacitors, or (3) installing synchronous condensers.

Replacing the existing motors with synchronous motors was not found to be economical because of the high cost per horsepower in the sizes needed. Installing synchronous condensers was out of the question for these reasons: (1) too great a first cost, (2) large power losses (10-15 per cent), and (3) correction of the power factor concentrated at one point. This left the only alternative of installing capacitors.

Decision to use capacitors . . . Panhandle Eastern decided to connect to the electrical load enough capacitors to bring the power factor as close to unity as possible within a reasonable cost figure. With an average power factor of 0.78 and an average load of 250 kw., a total of 200 kilovolt amperes reactance (kvar.) capacitors would be required to have a new power factor of 1.00. To change the power factor to 0.92 only 100 kvar. would be needed. This was the target figure used. It can be seen that installing twice as many capacitors would only increase the power factor 0.08.

A certain amount of danger is encountered when the power factor is altered in this manner due to the possibility of causing it to become leading at times. A leading power factor is as much a waste of energy as a lagging one and in some instances will cause motors to reverse running direction if rapidly stopped and started. Such reversal in direction can cause the motor shaft to break. Also, a large leading power factor will cause a voltage rise along the feeder lines, and this excess voltage results in excessive lamp burnout.

To protect from such a condition, it is necessary to have some method of varying the amount of capacitors connected with load variations. Automatic switching is very expensive and in some cases the cost is greater than the cost of the condensers. Manual switching was not considered positive enough because of human error.

Panhandle Eastern overcame the increased expense by connecting one-half the total of the capacitors to the generators' bus and one-half on the load side of the motor-control equipment. Thus 50-kvar. capacitors were connected to the generators at all times, giving an improved power factor at minimum load but never causing the power factor to become leading. The 50-kvar. connected at the motor terminals are switched off and on at the system the same time with the motors. This arrangement is shown in Fig. 5. Each motor supplied with a capacitor showed a reduction in running current of approximately 10 per cent, thereby reducing the I^2R loss in their feeders.

Savings

Correcting the power factor at Montezuma compressor station from 0.77 to 0.92 was accomplished at a cost of less than $25 per kvar. The installation increased the generating capacity some 15 per cent. Stated in another manner, the installation saved approximately 50,000 volt-amp. at average conditions, 50,000 volt-amp. reflects an average savings of 222 amp. As the efficiency of the prime movers and generators would not be changed, this then is a saving of 67 hp. at the prime movers. The estimated cost per horsepower of installing an additional generator was greater than $150, so that the increased capacity was obtained for $7,500 less than if an equal amount of generation had been installed. Longer motor life can be expected also. **End.**

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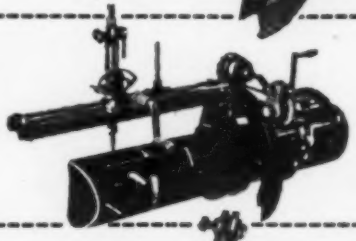

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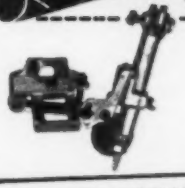

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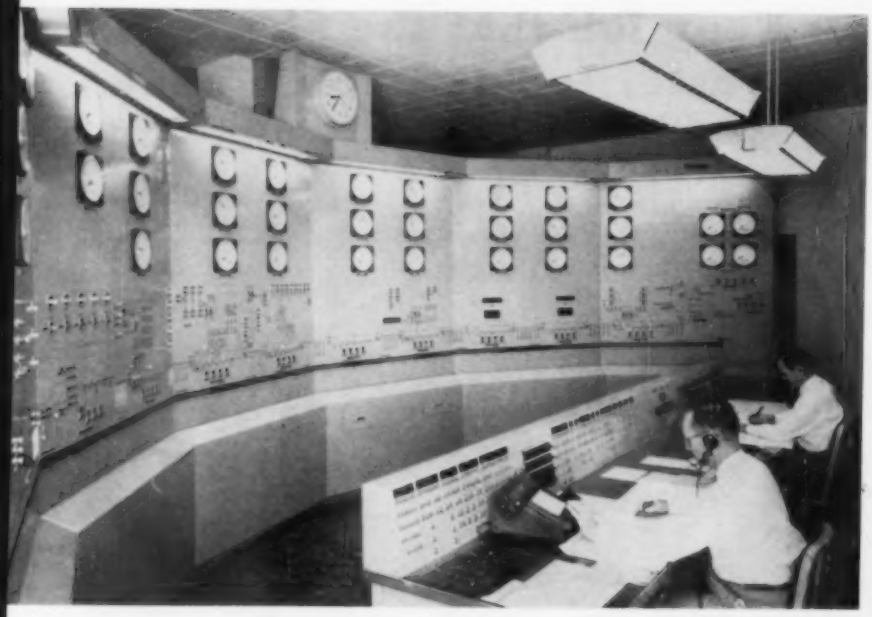
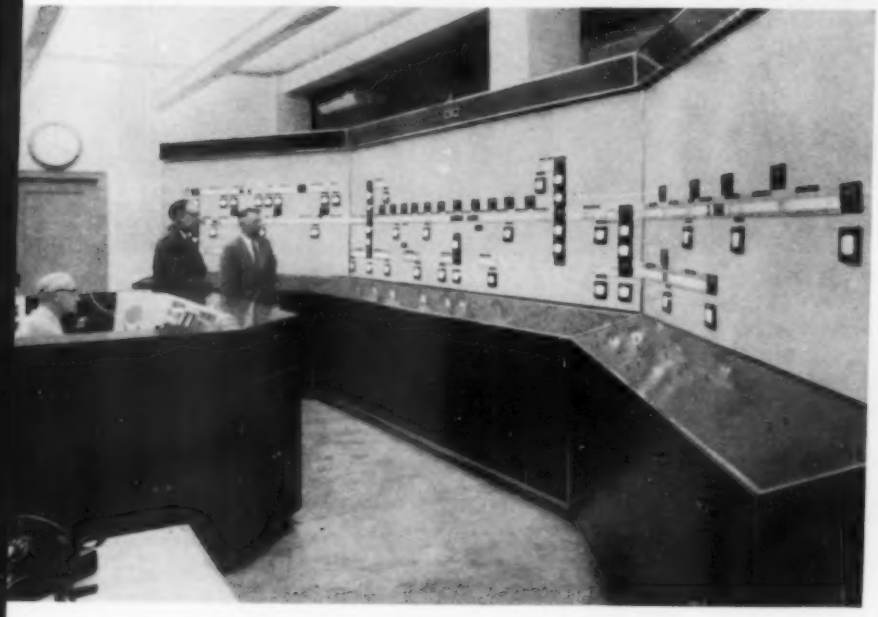


Remote Control for Crude



And for Products Stations

Sinclair studied, decided unattended stations are practical, selected a combination of remote supervisory control with local hydraulic supervision and telemetering.

By Glenn L. Ladd

STATIONS

IN MID-1953 Sinclair Pipe Line Co. began studying the economics of unattended pipeline stations. The company had been quick to realize the potential advantages of unattended stations on completing the modern all-electric 22 and 24-in. system from Cushing, Okla., to East Chicago, Ind. There was a 24-channel microwave system available for both crude and products operations.

The plan was to consider first modifying an existing crude-oil or petroleum-products station as an experimental, fully automatic remote-control station. Controls and supervisory equipment which were best adaptable to present and future needs were to be selected.

Results of the study showed that unattended stations were practical. A combination of remote supervisory control with local hydraulic supervision and telemetering could be economically justified for trunk-line stations. This type of installation was selected as being best suited to Sinclair's operations.

With remote supervisory control, local hydraulic supervision, and telemetering, the dispatcher has complete control of the operation. In case of communication failure, operations can be continued by local hydraulic control.

Conversion to Remote Control

The first installation was the conversion of a products station which went into operation in May 1954. It proved to be successful. By the end of 1955, nine products stations and three crude trunk-line stations had been modified and adapted to unattended operation.

These stations are designed for complete remote control from a centralized point. They have local hydraulic control and are fully automatic. On-call telemetering is employed for the suction and discharge pressures at the products stations. For the crude stations, continuous telemetering is used for both pressures and flow.

Remote-control details . . . The stations are supervised and the dispatching is handled from centralized control stations at Independence, Kans.; Fort Worth, Tex.; Marion, Ohio; and Sinclair, Wyo. At the home office in Independence, two separate independent dispatching systems are utilized, one for the products and one for the crude stations. The control boards in all the dispatching offices are modern in every detail. Graphic layouts, indicating lamps, and coloring arrangements show the operating

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THE AUTHOR

Glenn L. Ladd is chief electrical engineer, Sinclair Pipe Line Co., Independence, Kans. He has been engaged in electrical design and supervisory - control problems connected with pipeline pumping stations since 1951. Prior to joining Sinclair Pipe Line Co., Ladd was installation and maintenance engineer with Arrow Drilling Co. and electrical engineer with Sinclair Oil & Gas Co. He was graduated from Oklahoma A. & M. College in 1932 with a B.S. in electrical engineering.

dispatcher at a glance the status of the system.

For intermediate booster or large gathering stations, a simple outdoor station with a hydraulic-control system was developed and experience has proved such a station to be very dependable and economical.

The company recently completed two intermediate stations on the Houston-to-Arlington, Tex., products system; Ross station near Ross, Tex.; and Plantersville station near Plantersville, Tex.

The two 600-hp. pumping units at these stations operate automatically as a function of the hydraulic pressures resulting from varying flow conditions. Provisions are included for automatically determining whether one or two units will run depending upon line-flow conditions as sensed by several pressure switches. Automatic shutdown and startup to allow for scraper passage is also provided for.

Control of Operating Conditions

Hand-automatic switches on each individual unit permit three different normal station operating conditions to be set up by manually positioning the switches as follows:

Condition No. 1 . . . No. 1 unit only to run as controlled by a master control pressure switch. The No. 1 unit "H-A" switch in the "auto" position and the No. 2 unit "H-A" switch in the "hand" position. When the outgoing line pressure rises to the "preset" start point of the master control pressure switch, the No. 1 unit suction valve starts opening. As soon as the suction valve is completely open, the No. 1 unit motor starts. Simultaneously, the No. 1 unit control valve starts opening at a slow rate with the master pressure controller in the circuit ready to override at any time to maintain minimum suction and maximum outgoing line pressures.

When the outgoing line pressure drops to the "preset" shutdown point on the master control pressure switch, the No. 1 unit will stop. Simultaneously, the No. 1 unit suction valve starts closing and the No. 1 unit control valve closes. As soon as the suction valve is closed, all devices assume the at-rest position.

Condition No. 2 . . . No. 2 unit only to run as controlled by the master control pressure switch. The No. 1 unit "H-A" switch in the "hand" position and the No. 2 unit "H-A" switch in the "auto" position.

At this condition, the operating sequence is exactly the same as in operating condition No. 1, except in this case the master pressure controller operates the No. 2 unit control valve.

Condition No. 3 . . . Both the No. 1 and No. 2 units to run as controlled by the master control pressure switch and the auxiliary control pressure switch. The No. 1 "H-A" switch in the "auto" position and the No. 2 unit "H-A" switch also in the "auto" position. In this condition the downstream unit No. 2 will always start first. In case some protective device should keep the No. 2 unit from starting, after a short delay the No. 1 unit will automatically start.

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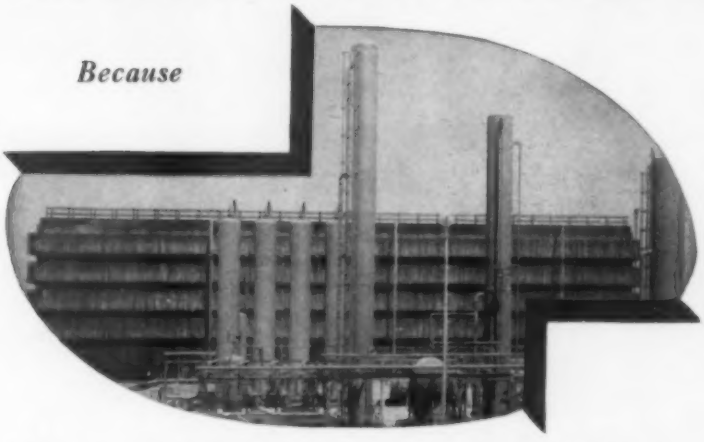

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rises to a "preset" start point, the No. 2 unit will start as described in Condition No. 1 above. A timed interval after the No. 2 unit starts, the No. 1 unit will start, provided that the pressure on the auxiliary control pressure switch is above the "preset" start point for the No. 1 unit. In case the incoming line pressure should drop to or near the suction control point after the No. 2 unit starts, this low pressure, being the same as sensed by the auxiliary control pressure switch with the No. 1 unit down, will not allow the No. 1 unit to start.

However, if the upstream station pressure is increasing, the pressure on the auxiliary control pressure switch will increase, eventually reaching the "preset" starting point for the No. 1 unit. A timer prevents the No. 1 unit from starting immediately after the No. 2 unit has started. After this timer has timed out, the No. 1 unit will start with normal sequence. Simultaneously, a three-way solenoid valve operates to throw the auxiliary pressure controller into operation to limit the head pressure on the No. 2 unit and also to assume primary control of the station suction pressure.

The No. 1 unit will shutdown if, while both units are running, the pressure on the auxiliary control pressure switch drops to the "preset" shutdown point. This drop would result from the auxiliary pressure controller's operating to maintain the minimum station suction pressure. The No. 2 unit will continue to run, provided the incoming suction pressure is not reduced to a point where the suction controller causes the outgoing line pressure to drop below the shutdown point of the master control pressure switch. In case it is necessary to shut down both units, sufficient upstream pressure reduction will shut down the No. 2 unit with normal sequence. If the No. 2 unit should stop while both units are running, it may not be restarted until the No. 1 unit has been taken off the line.

Two-position "normal - start" sequence start selector switches are provided. One overrides the master control pressure switch. The other overrides the auxiliary control pressure switch for testing and provides the means to start the units without having to raise the station bypass pressure. Indicating lights and an annunciator drop with buzzer show the status of the selector switches and insure that the selector switches are left in the normal position.

Both units may be manually operated by placing the "hand-automatic" switches in the hand position. In this position, all sequence controls are out of the circuit but the safety protective devices remain operative. Also, in this position the units must be started by individual local push-button stations on the suction valves and motors. All stop buttons are operative at all times.

A two - position, normal - override switch allows the station to be restarted and the sump pumped down after the station has been automatically shut down by the high sump level control. The same annunciator and buzzer mentioned above will operate while the switch is in the "override" position.

Rate of Flow Control

A unique feature in these stations is the use of solenoid valves, air relays, and restrictor units to control rate of flow and consequently the load during dynamic or "line-packing conditions." The method is a compromise and is possibly not as effective as electrical load control.

Both types of unattended stations are reliable. They are economical, efficient, and have proved very satisfactory for Sinclair's operations.

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When Southern Natural Gas Co. was faced with the need to build a compressor station off the Louisiana coast, the company conducted a study of remote vs. attended operation. Remote operation was favored because it was undesirable to have personnel living on an isolated platform.

And the investment for an unattended station, although higher, will pay out within 3 years. Southern Natural's decision to adopt remote control was born out of necessity. The company believes a separate appraisal must be made of each proposed use of remote control.

Southern Natural Chooses Remote Control

For Offshore Installation

By William E. Matthews IV
Southern Natural Gas Co.

THREE alternatives were available to Southern Natural Gas Co. in selecting a method of operation for its offshore compressor station south of New Orleans:

- The station could be operated by personnel living on the platform.
- The station could be unattended and operated only by local automatic controls governed by maximum and minimum gas flow conditions in the pipeline and by shutdown controls affected by mechanical conditions in the engine and compressor.
- The station could be unattended but remote controlled from a more desirable and accessible location.

The unattended local automatic control method of operation, while acceptable for gathering systems, we immediately eliminated from our thinking since this operation does not afford a high degree of reliability and flexibility on a transmission system.

Of the two remaining methods of operation, we knew nothing about remote control whereas we were thoroughly familiar with operation of attended land stations. We, therefore, decided that station operation by personnel living on the platform would be used in our preliminary planning; however, since even this method of

STATIONS

Engineers answer a challenge

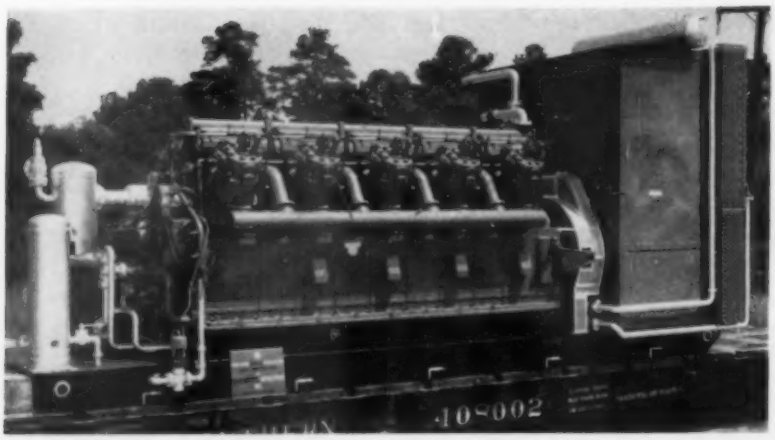
Necessity has sired many inventions. Through necessity oil men were forced to enter the marshy swamp and offshore regions of South Louisiana in search of oil and gas supplies to replenish dwindling reserves. These ventures required development of new techniques and designs in the exploration for and the production and gathering of these newfound reserves. The tremendous offshore drilling rigs, the large pipe-laying barges, the offshore platforms, and other associated equipment are all examples and products of necessity.

Now the offshore gas and oil reserves have been tapped, gathering lines laid, and systems put into operation. The pipeline industry has conquered the offshore region in operation know-how and techniques; however, this accomplishment represents the completion of only the first phase of this operation.

The second phase of any pipeline opertion consists of the installation of pump or compressor facilities to supplement the decline in reservoir pressures and needs for increased pipeline throughput.

In the fall of 1956, Southern Natural's entry into this second phase was outlined by statistical and planning department reports which indicated that compression would be required the following year at the junction of the Breton Island-Coquille Bay-Romere Pass lines. This junction is located about 45 miles south of New Orleans and about 5 miles east of the Mississippi River on the edge of the gulf and is accessible only by seaplane or boat.

The necessity for installing compressor facilities at a location such as this presented quite a challenge to engineering and operating department personnel in developing methods of design, construction, and operation. A considerable amount of information and experience in offshore construction and design of drilling, production, and measuring platforms was already available; however, such was not the case with operation methods. Therefore, the greatest of these challenges to the company was to develop a method of operation for this station.



SOUTHERN NATURAL chose two 600-hp. skid-mounted Cooper-Bessemer package compressor plants of this type for offshore installation. (Photo courtesy Southwest Industries, Inc., which packaged the unit.)

operation differed considerably from the similar method of operation on land we felt that before making a final decision we should study both methods.

Attended operation . . . Our study of operation of the station by personnel living on the platform revealed several serious problems not common to land-based stations. One of these problems involves the need to evacuate personnel from the platform in event of a storm warning. Another problem concerns personnel morale and living standards on platforms.

We readily realized that life on a platform even for short periods of time under the best available living conditions can in no way equal or compare with life at home. We concluded that even though operation of the station by personnel living on the platform was possible, the associated problems of personnel welfare and morale definitely indicated the need for a more suitable method of operation.

Remote-operation study . . . At the beginning of our study of remote control our knowledge of the subject was very limited. We were familiar with published articles about Gulf Interstate's use of remote control for operation of a compressor station from a location 80 miles distant. And we knew about the Northern Natural Cooper-Bessemer development of an automatic-control panel for controlling an engine from a location on the compressor station site other than at the engine.

With this limited knowledge, we began the study with several primary objectives. We sought to determine:

. . . The practicability.

. . . The economic feasibility.

. . . The reliability.

. . . Availability of equipment that had already been designed, manufactured, and field proven.

. . . The advantages and disadvantages of remote control as opposed to operation by personnel living on the platform.

Summarizing, we concluded that remote control as applied to an offshore compressor station was very definitely practical. The economic study of remote control was based on a comparison with the economics of control by personnel living on the platform. It was found a remote-control installation would require a 16 per cent greater capital investment. But lower operating expenses would permit a payout of the additional investment in a maximum of 3 years.

Therefore, we further concluded that remote control was both economically feasible and desirable. Equipment for this installation was commercially available and had been thoroughly proven through use in the pipeline and other industries, notably the electrical industry. The reliability obtained by these other users of this equipment satisfied our requirements for operation.

Advantages and disadvantages . . . The last and probably most important objective of our study was to analyze the advantages and disadvantages of remote control as opposed to operation by personnel living on the platform. Since a remote-controlled station would not require crews living on the platform, personnel assigned to maintain this station would have the same living conditions as personnel assigned to any land station.

Remote control has certain disadvantages. These disadvantages are primarily found in:

- Failure of the signal transmission path.

STATIONS

- Failure of engine equipment.
- Failure of control equipment.

Microwave vs. submerged cable . . . Extent of the unreliability of the signal transmission path depends on the means of transmission being considered. We considered either a submerged cable or a microwave system. Comparison of the installation cost of 42 miles of submerged cable containing the number of circuits comparable to a microwave system and the installation cost of a microwave system definitely favored the microwave.

Our study also indicated that the maintenance cost of 42 miles of cable submerged in the pipe canal would exceed that for a microwave system covering the same distance. Also outages due to cable damage in the canal would last so long and be so hard to repair as to rule out this type of signal carrier. Our decision concerning the most suitable means of signal transmission was further influenced by the high degree of reliability guaranteed by manufacturers for microwave in this area and even more by the favorable experience of other companies using microwave.

These companies were very helpful in making recommendations for the installation of complete standby equipment and the installation of air-conditioning equipment. Thus, while path failures do exist in any remote-control system, we feel that the frequency of the failures will be negligible in a properly installed and maintained microwave system and, therefore, will not seriously hamper operations.

Engine, control equipment . . . With remote control the only unreliability to be expected would be interruption of operation due to minor failures. Such minor failures would, of course, be quickly cured if personnel were at the station. But in the case of more serious damage, help in addition to any permanent personnel and also major repair parts would be necessary. Therefore under such conditions the remote-controlled operation would not be a disadvantage. For in such a situation a maintenance gang would have to come out from shore whether or not the station were unattended or operated by remote control.

The fact that remote-control operation does not afford personnel at the engine for immediately detecting and limiting extent of damage is not considered to be a disadvantage. The engines will be protected by every known protective shutdown device. We consider these shutdown devices

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to be more reliable and quicker acting than an attendant. It is, therefore, evident that the only disadvantage in this regard consists of minor failures.

The last disadvantage which we saw in the remote-control method of operation was the possible unreliability of the control equipment. As mentioned above, the reliability of electronic equipment can be greatly improved when the equipment is located in an air-conditioned control room. We also believe that in addition to air conditioning, another method for obtaining good reliability is through use of good preventive-maintenance procedures.

Remote Control Favored

We feel that while remote control has certain disadvantages, these are less than the disadvantages associated with operation by personnel living on the platform. Furthermore, the elimination of personnel living on the platform and the associated problems is a very significant advantage of the remote-control method over the personnel-control method. Therefore, we concluded that the remote-control method was the most desirable method of operation for our proposed offshore compressor station.

Having made the decision, our next consideration was design of this station. We were convinced that simplicity and reliability should be the objective in the design of a remote-controlled compressor station. There are several methods available for obtaining the maximum simplicity and reliability in this design. Most important is unitization of the engine and accessories.

Another method is the use of a programed or sequenced start-and-stop procedure. In each of these methods simplification and reliability are achieved by reducing the number of functions to be controlled or supervised by personnel at a distant point. We decided that the most suitable means of unitizing an engine for offshore installations was to purchase skid-mounted packaged compressor plants. The equipment selected for this purpose was two Cooper-Bessemer GMXD-10, 660-b.hp. skid-mounted package compressor plants. We also decided to use Cooper-Bessemer automatic-control panels for providing a programed or sequenced start-and-stop control of the engines.

Supervisory control . . . Simplicity and reliability also ruled in selection of equipment to maintain supervisory control of the engines through the automatic-control panels. Control Corp. equipment which was purchased will send and receive groups of coded signals of different frequencies, each group representing a control or telemetering function. The portion of this equipment located at the platform compressor station will receive, decode, and supply the electrical impulses to the control panels which in turn actually control the engines and valves.

Through this arrangement, we can start or stop the engine with the transmission of one group of coded tone signals. This eliminates the multiplicity of signals needed to control each function as in the non-sequenced start-and-stop procedure. The control console with accessories will be located at Toca, our main-line supply compressor station near New Orleans. This station will be the control center for the Olga offshore station which will be located 42 air line miles south of Toca.

Microwave . . . Transmission of the control signals will be via a General Electric microwave system. This system will cover the 42 miles in two hops, each hop spanning about 25 miles. By adopting these hops of 25 miles, we were able to locate the repeater station at a very accessible site near Port Sulphur along the New Orleans-Venice highway. We are convinced that this general microwave arrangement which is in accordance with the recommendations of the other companies using microwave should greatly enhance our system reliability.

Currently the design phase is almost finished and construction has started. Target date for completion is in October or November.

Remote-Control Future

What then is our opinion concerning the future of remote control? We believe that it very definitely has a future in the pipeline industry. However, we do not believe that any all-encompassing statements can be made regarding its applicability. It is our opinion that a separate appraisal must be made of each proposed usage of remote control, because factors affecting its applicability are all variables and therefore are subject to change with time and location.

Necessity, one of the most important of these factors, prompted Southern Natural to investigate and adopt remote control as the method for operation of the company's first offshore compressor station. It will undoubtedly continue to play an important role in the company's future considerations of remote control.

End.

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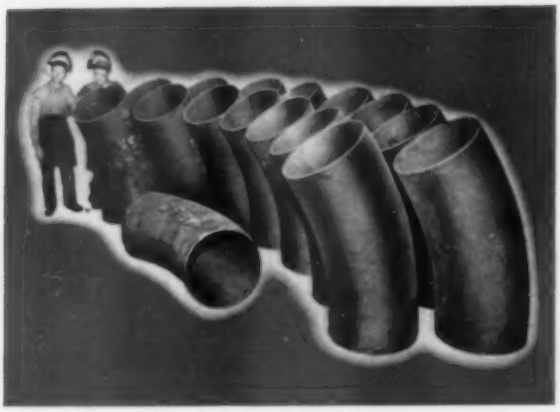

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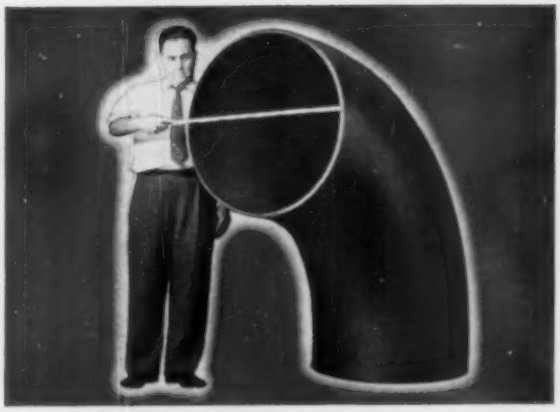

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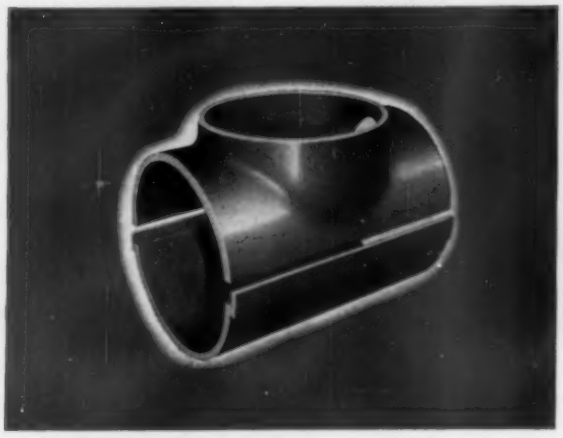

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In this article, the first of three, recommendations are made for the equipment and measuring techniques and procedures to be used for determination of pipeline-flow efficiency. The second article discusses the calculation of flow efficiency from test data, and the third presents methods for estimating the error in measured quantities and in the calculated flow efficiency. The recommended procedures were developed by the Institute of Gas Technology under the sponsorship of the Pipeline Research Committee of the American Gas Association. The procedures are presented in condensed form; publication of the complete recommendations will be made upon completion of the current phases of the work.

Pipeline-Flow Efficiency Testing

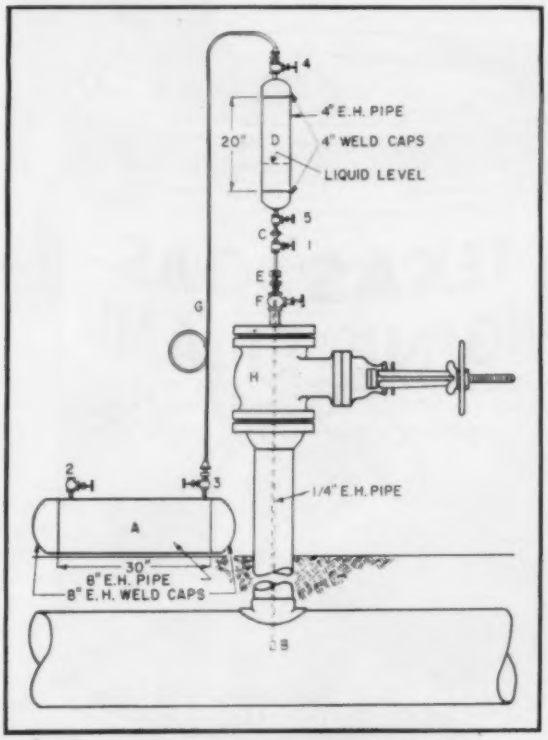
By R. F. Bukacek and R. T. Ellington
Institute of Gas Technology, Chicago

I. TESTING PROCEDURES

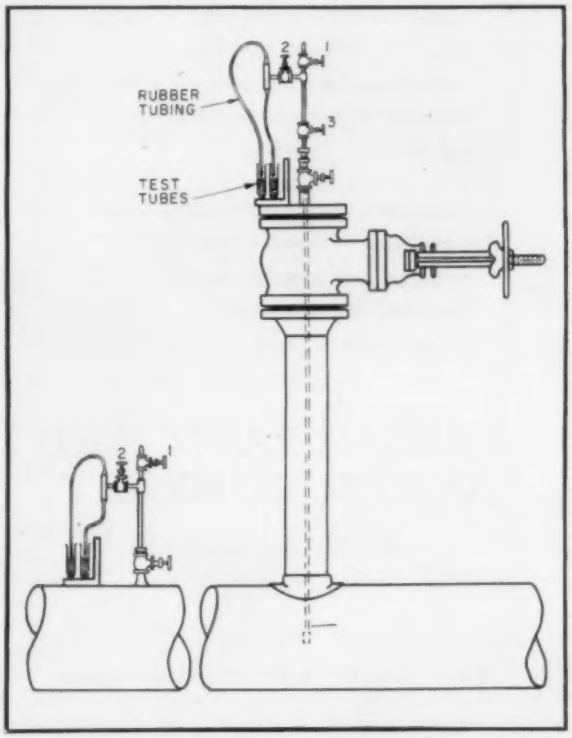
FOR MANY YEARS the transmission capacity and operating characteristics of high-pressure natural-gas-transmission lines have been determined with the use of standard empirical flow formulas. Two of the more popular formulas, known as the "Weymouth" and the "Panhandle" formulas, have been widely used and considerable dependence is placed upon the results obtained from their use.

It is common practice, however, to modify the flow formula by an "experience factor" which is better known as the "flow efficiency." This modification is added to the formula as a factor "E" in the equation. This flow efficiency of a pipeline is defined more exactly as the ratio of the actual measured gas flow through the line to the flow calculated by use of an equation such as the Weymouth or the Panhandle from the operating conditions at the time of actual flow measurement.

In recent years it has become important to determine the capacity of transmission systems within increasingly closer limits. The more important reasons for this are associated with the design of incremental facilities to be added to a system for the purpose of supplying expanding market requirements; the determination



AMMONIA INJECTION with a pressure tank is made with this setup, adapted from a Panhandle Eastern Pipe Line Co. drawing. Fig. 1.



AMMONIA-DETECTION equipment is set up at tap (left) and at blowoff riser. Fig. 2.

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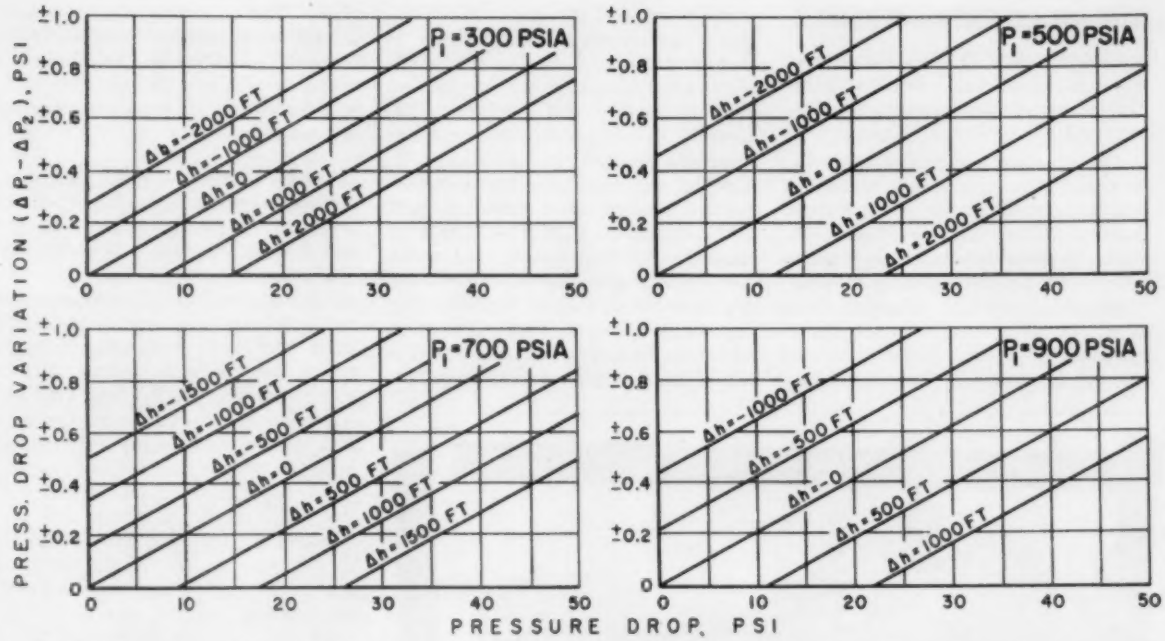

PRESS. DROP VARIATION ($\Delta P_1 - \Delta P_2$), PSI
PRESSURE DROP, PSI
P_1 = 300 PSIA
Δh = -2000 FT
Δh = -1000 FT
Δh = 0
Δh = 1000 FT
Δh = 2000 FT
P_1 = 500 PSIA
Δh = -2000 FT
Δh = -1000 FT
Δh = 0
Δh = 1000 FT
Δh = 2000 FT
P_1 = 700 PSIA
Δh = -1500 FT
Δh = -1000 FT
Δh = -500 FT
Δh = 0
Δh = 500 FT
Δh = 1000 FT
Δh = 1500 FT
P_1 = 900 PSIA
Δh = -1000 FT
Δh = -500 FT
Δh = -0
Δh = 500 FT
Δh = 1000 FT

VARIATIONS in pressure drop which will give 1 per cent variation in calculated efficiency are shown for various operating conditions. Fig. 3.

of the advisability of conducting pipeline cleaning programs to maintain maximum flow capacity; and a more exact basis of design for facilities required in high-load-factor operation.

If the flow formula correctly interprets the range of conditions to be experienced in the use of the transmission system, a more accurate prediction of flow capacity depends upon a better knowledge of flow efficiency.

A number of methods have been developed for determining pipeline flow efficiency, but until recently there has been no examination of these procedures to determine which yields the best results. There have been no criteria for evaluating the reliability of data obtained under actual flow conditions, or the applicability of various measurement techniques to this procedure.

The procedures recommended in this article are the result of extensive observation of field tests, consultation with men engaged in pipeline efficiency-test work, and analysis of the limitations of the various methods used to obtain the measurements involved in the determination of flow efficiency. Since the efficiency test is an advancement in the technique of obtaining quantitative performance characteristics of a pipeline, these procedures should be of interest to any company needing such information.

General Procedures and Equipment.

Before pipeline efficiency tests can be conducted properly many departments concerned with pipeline operation must be informed of the importance of the tests, the difficulty of obtaining valid test data, and the necessity for close cooperation with the test crews while they are setting up and conducting tests.

Since all the equations used to calculate the flow in a pipeline apply to steady-state operation only, it is absolutely necessary that pipeline conditions be stabilized for the tests. The dispatcher must understand the nature of the tests and the importance of pressure stability, and compressor station personnel must be properly instructed.

For example, on change of shift, the new operating force may find that operating pressures are being held, for the tests, at values different from the general pressure order. They should be carefully instructed to maintain the existing pressures until the tests are completed or operating requirements force change. Field personnel should be instructed to correct line conditions which might affect the validity of the test; for example, drips should be blown to remove liquid accumulations.

Field measurements must be made of the flow rate, pressures, temperatures, and specific gravity of the gas, the elevation change between the ends of the test section, and atmospheric pressure at each end. The equipment required to make these measurements includes calibrated deadweight test gages, two temperature-compensated aneroid barometers, thermometers, a

DESIGN-CONSTRUCTION

gas gravity balance, and such accessory fittings, tubing, and communication gear as circumstances require.

The equipment for flow determination varies depending upon the method employed, as will be shown. Only two methods of obtaining rate of flow are recommended due to limits of accuracy required. The use of commercial orifice measurement is usually preferred when such meters are located near the test site; however, orifice meters installed for sales and system measurement are not normally located where they can be made available for such purpose. For this reason, considerable detail on the use of anhydrous ammonia is set out herein. Where orifice meters are not available for the flow tests, the use of ammonia as described will provide accurate flow data.

Orifice Meters

Orifice-meter installations should be designed and the calculation of flowing quantities from chart data made in accordance with the American Gas Association's Gas Measurement Committee Reports No. 2 and 3.[1,2]

Ammonia Tracer Flow Metering

In this method of flow measurement a small amount of detectable material is injected into the pipeline and the time taken for it to travel between precisely located points is measured. The volumetric flow rate is cal-

culated (see Part 2) from the distance traveled, travel time, nominal inside pipe diameter, and average gas pressure and temperature.

The distance between tracer injection and detection points should be long enough to permit accurate measurement of the tracer travel time. The travel distance should be as great as possible to minimize errors in determination of pipeline mileage. However, the distance must not be so great as to permit dispersal of the tracer and make its detection difficult. Five to fifteen-mile travel distances are ordinarily satisfactory.

Anhydrous ammonia is commonly used as a tracer because of its low cost, availability, and the ease of detection. The equipment required for injection includes an ammonia-storage cylinder; a high-pressure bottle, with a stainless-steel valve at each end, to hold a 3 to 5-lb. charge of ammonia; a stop watch; and auxiliary fittings and equipment depending upon the method of injection. The amount of ammonia required depends upon line size, flow rate, and the condition of the interior surface of the pipe. The handling of ammonia should be guided by National Safety Council Data Sheet D-251. Brass and copper valves and fittings should not be used in contact with ammonia under pressure.

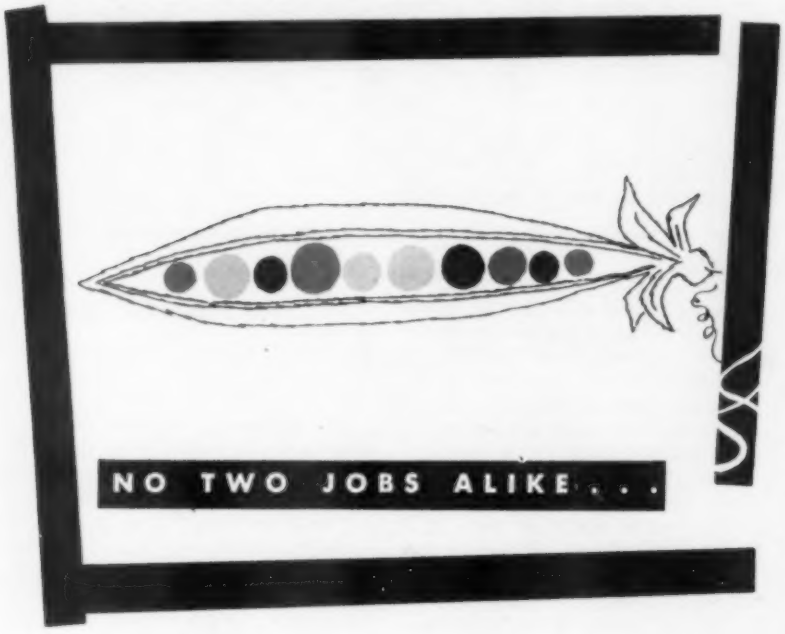
Injection method . . . The equipment for one injection method is illustrated in Fig. 1, where entry into the pipeline is made through a blowoff riser. The pressure tank A (capacity: 1 to 2 cu. ft.) is filled to line pressure with gas from the riser, and disconnected from the riser. A length of extra-heavy ¼-in. pipe is inserted into the riser through a stuffing box. This pipe is fitted with a ¼-in. coupling stop B at the lower end, to prevent the pipe being blown through the stuffing box in event of mishap, and a union C, and valve 1, at the upper end.

Valve 1 is left open during insertion of the pipe to reduce the force required to insert it, and is closed when the stuffing box nut has been tightened and the pipe is secured to the riser assembly. A rope or chain looped across valve 1 and around the riser valve body may be used as a further precaution. The high-pressure bottle D, containing from 3 to 5 lb. of anhydrous ammonia, is attached to the tubing at union C.

The pressure in tank A is then increased by injection of water, from a portable piston pump connected to valve 2, to approximately 200 psi. above line pressure. A small Bourdon gage may be attached to valve 2 for determination of the tank pressure. Valve 2 is closed, ¼-in. copper tubing is run from valve 3 and 4, and both of the latter are opened, admitting high-pressure gas to the space above the ammonia in the bottle.

Valve 1 is opened; then valve 5 is opened as rapidly as possible to inject the ammonia in a slug and the stop watch is started immediately. The instant the valve permits ammonia to flow is usually apparent from the sound of the ammonia passing through it. Valves 1 and 5 should be gate valves, to minimize the time required to empty the bottle. At this time the pressure at valve 2 should be read to determine whether the injection was successful.

In the above scheme, a cylinder of commercial high-pressure nitrogen (available at 2,000 psi.) may be substituted for pressure tank A. Also, any tap in the pipeline may be used for injection; however, for taps over an inch in diameter, ¼-in. pipe should be inserted through a stuffing box, as described above. In any case, direct and rapid injection into the main gas stream is essential to accurate timing of the tracer's travel.



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Ammonia detection . . . Fig. 2 shows ammonia detection equipment set up at a tap (lower left), or at a blowoff riser (right). The equipment includes a manifold system consisting of ¼-in. pipe with tee connection and two ¼-in. valves, rubber or tygon tubing, several test tubes or small bottles for the chemical indicator, and auxiliary fittings as required for the detection location. If taps over an inch in diameter are used, ¼-in. pipe must be inserted through a stuffing box into the main gas stream, as described in the paragraphs on injection.

The test reagent is made from distilled water, and a stock solution of phenolphthalein (1 g. of phenolphthalein dissolved in 50 cc. of alcohol to which is added 50 cc. of distilled water). For use as an indicator, two drops of the stock solution are added to 30 cc. of distilled water. This liquid is colorless, but turns pink in the presence of ammonia. Only distilled water should be used, since contaminants in undistilled water may affect the sensitivity of the indicator, or color it.

With the manifold system installed as shown in Fig. 2, a test tube (or small bottle) of the indicator is placed in a rack close to it, or is suspended from it by a short cord. Valve 1 is then opened, venting gas to the atmosphere. A piece of rubber or tygon tubing is connected downstream of valve 2, which is opened slowly until a moderate flow of gas is passing through the tubing. The open end of the tubing is placed in the test tube, either below the indicator surface, or very slightly above it, and valve 2 is adjusted to establish intimate contact between gas and indicator.

Stop watches are used at both injection and detection points to time the tracer's travel. The starting watch may be transferred to the detection point if there is sufficient time, or the starting time may be forwarded to the detection point by radio. A common procedure in forwarding starting time is: "On the mark the time will be X minutes — 5 — 4 — 3 — 2 — 1 — Mark!" where X minutes have elapsed between the injection and mark time. At mark time the stop watch at the detection point is started; it is stopped when the indicator changes color. The time of tracer travel is that recorded at the detection point, plus the X minutes between injection and mark time.

Pressure Measurement

Pressure readings must be taken at the terminals of the line section under efficiency test, and at the injection and detection points when a tracer is used to determine flow rate. In all cases a series of readings should be made and recorded at 10-minute intervals at each point to permit determination of the degree of line-pressure stabilization. If a tracer is used, pressure readings should be started at least a half hour before injection and continued through the period of tracer travel; two-way radio communication is helpful since it permits coordination of the operations and comparison of the readings.

Measurements should be made to the nearest 0.1 psi. with calibrated deadweight gages. The weights belonging to each gage should be numbered consecutively, beginning with the heaviest. At all times, in calibration or field work, weights should be added in numerical order. This procedure simplifies correction of pressure readings, since it eliminates the necessity of keeping a record of the weights used. As a minimum precaution the gages should be calibrated with a deadweight tester, or against one of the gages chosen as standard.

Since absolute pressures are re-

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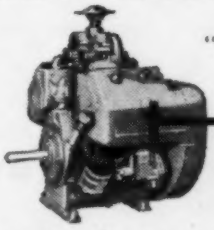

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quired in the calculation of efficiency, the barometric pressure should be measured at the pressure stations. Atmospheric pressure variations due to changes in elevation and local weather conditions can be important especially for tests at small pressure drops.

Gas-Temperature Measurement

Gas-temperature measurements may be made by inserting a thermometer into the gas stream or may be approximated by obtaining the pipe-wall temperature. Pipe temperature should be obtained by placing the thermometer bulb or thermocouple junction in very good contact with the pipe wall, Inserting the thermometer bulb down a bar hole to the pipe is satisfactory only under favorable conditions.

Gas Gravity

A gas specific-gravity measurement should be made at the time of test. Where station gravitometers are located sufficiently near the test site, their readings may be used; however, where specific-gravity changes occur frequently, or where an accurate station measurement is not available, a portable Ac-Me or Arcco-Anubis gravity balance should be used. Gas specific gravity can be affected by contaminants in the line and by gas processing and mixing; hence appreciable errors can be incurred through failure to measure this property.

The most accurate method of determining gas-compressibility factors is the direct measurement, with a Bean or Burnett apparatus, on a sample taken at the time of test. Ordinarily it is more convenient to make use of a suitable correlation of compressibility factor. The American Gas Association's "Supercompressibility Factors for Natural Gas" (1955)[4], and "Orifice Metering of Natural Gas" (1955)[3], present correlations of supercompressibility factors, $F_{pv} = (1/z)^{\frac{1}{2}}$ (z is the compressibility factor), that are admirably suited to efficiency test use. These correlations require gas specific gravity, carbon dioxide and nitrogen content, or gas specific gravity, heating value, and carbon dioxide content.

Elevation Change

Elevation changes are best determined by a land survey. Where this is not practical and accurate elevation data are not available, compensated aneroid barometers calibrated to show elevation above sea level may be used. Elevations determined by barometer are subject to instrument errors and variations in atmospheric pressure.

Atmospheric pressure effects can be minimized by adjusting two barometers to read together at the same point and time, and taking simultaneous readings for a period of approximately a half hour, at the ends of the section for which the elevation change is to be determined. Although atmospheric pressure may be rising or falling, it will ordinarily be found that the difference between the readings is fairly constant.

Determining Line Stability

Since the flowing fluid is compressible, it is not possible to develop a simple, precise mathematical relationship which can be used to determine the stability of flow required in pipeline-efficiency test work. It is possible, however, to establish practical indexes of line stability which suffice for most conditions encountered.

In general, constancy of flow rate and pressures at various points along the pipeline indicates stable conditions within the line. However, both the pressure at a given point and flow rate will ordinarily vary under the best conditions that will be encountered. The problem, therefore, is to determine the variations in these quantities that can be tolerated.

Where orifice meters are used to measure flow rate, constancy of static

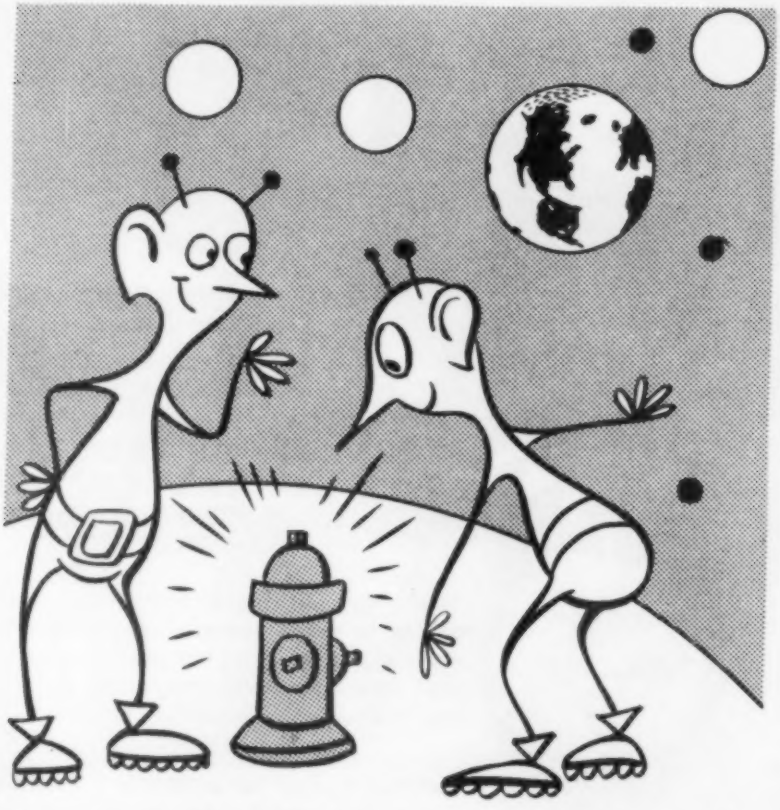

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TABLE 1
Pressure-Data-Recorded Psia

Time p.m.	Upstream	Downstream	ΔP
12.01	781.0	760.1	20.9
12:10	781.0	760.2	20.8
12:20	781.1	760.3	20.8
12:30	781.2	760.4	20.8
12:40	781.3	760.4	20.9
12:50	781.5	760.5	21.0
1:00	781.6	760.6	21.0

Assumed elevation change = 500 ft.

and differential pen readings is indicative of line stability at that point. If it is necessary to remove or add a considerable quantity of line pack gas to obtain the desired test conditions, constancy of flow and pressure at the inlet or outlet of the test section may indicate a degree of line stability that is not true for the test section as a whole. Therefore, it is usually desirable, even when orifice metering is employed, to examine line pressures at several points within the test section.

The packing effect makes the pressure at a given point a much less sensitive index of stability than the difference in pressure between two points. Pressure differential is usually an excellent index of line stability.

From pressure measurements obtained over a period of at least 45 minutes, pressure drops over a line section should be calculated for each pair of upstream and downstream pressures. From these, the variation in pressure drop is determined. Thus, for the data in Table 1, the variation in ΔP is 21.0 — 20.8 = 0.2 psia.

Pressure-drop variation . . . In most cases efforts should be made to secure line stability that will give less than 1 per cent variation in calculated flow efficiency for the observed varitation in pressure drop. In Fig. 3 variations in pressure drop which will give 1 per cent variation in calculated efficiency are shown for various operating conditions. For the pressure drop and elevation change in the example, and 700-psia. operating pressure, the variation in pressure drop is ± 0.25 psi. and for 900 psia. it is ± 0.18 psi. Thus the quoted conditions indicate adequate stabilization.

In case interpolation of the graphs becomes tedious, the lines are adequately represented by the equation

$$\delta(\Delta P) = 0.466 \times 10^{-6} P\Delta H + 0.0213\,\Delta P$$

Pressures taken at points of control, such as compressor stations or cracked valves, should not be used as an index of line stability. Pressures should be obtained at the ends of interior sections such as ammonia test sections.

Where station-to-station efficiency tests are made, Fig. 3 should not be extrapolated to the larger pressure drop values. The pressure variation in this case should be kept to within 1 to 2 psi. per hour at the terminals of the test section.

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End Part 1.

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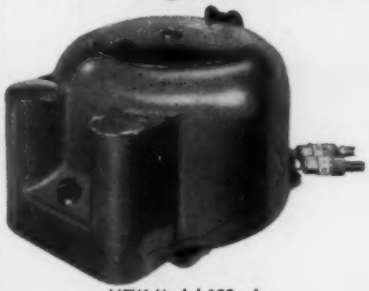

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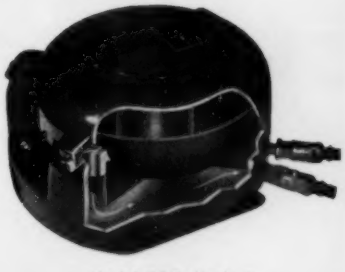

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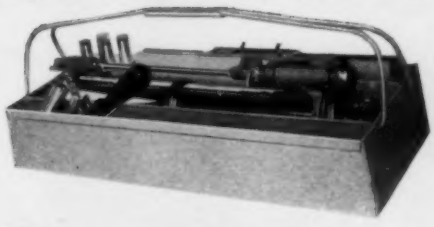

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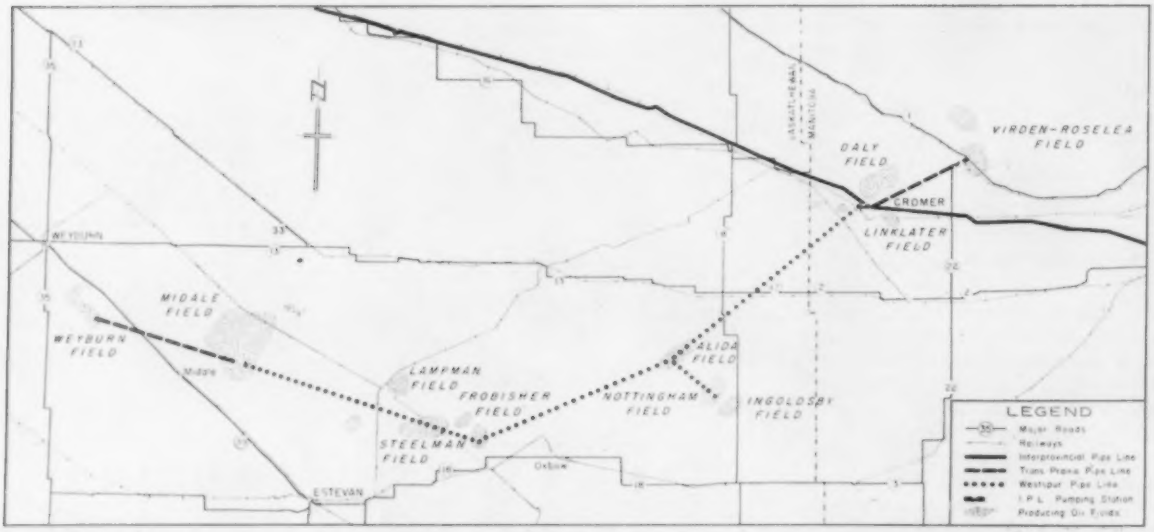


SASKATCHEWAN, MANITOBA discoveries feed oil into Cromer station, originally only a booster on the Interprovincial pipeline from Edmonton to the Great Lakes region.

Discovery Trend Follows Pipeline

. . . turns booster station into major receiving point

By N. H. McAfee
Interprovincial Pipe Line Co.

A MAP REFERENCE, chosen simply as the point of hydraulic balance for a booster station on the Interprovincial Pipe Line, has become the location of a major receiving and transmitting facility for crude oil from Saskatchewan and Manitoba.

Five years ago, Cromer station in western Manitoba was one of 11 similar stations on the crude-oil pipeline carrying Alberta oil to the markets of western Canada and the United States. Two pumping units were sufficient to boost an average of 100,000 bbl. per day along the 16-in. line.

Today, there are two complete pumping stations at Cromer with seven powerful units moving from 225,000 to 250,000 bbl. per day through the two lines of pipe. Looping with 24-in. pipe will, in effect, produce a second pipeline stretching from Regina, Sask., to Superior, Wis., when the last stages of looping are completed this month. The Cromer operation will soon monopolize the original 16-in. line and overflow into the new 24-in. line.

When the Interprovincial Pipe Line was first planned, it was to be a relatively short line from the newly discovered Leduc field in Alberta to the refineries at Regina in the neighboring province of Saskatchewan. Before the line was started, however, additional discoveries—especially that of rich Redwater field, made it obvious that a larger market than the prairie refineries was needed. The market of eastern Canada and the United States was indicated and the pipeline was redesigned to take advantage of the relatively cheap marine transportation afforded by the Great Lakes chain.

With the new terminus at Superior, the point of hydraulic balance between Regina and Superior was found to be Gretna, Man.—just north of the international boundary. The midpoint between Gretna and Regina was Cromer, Man. A booster station was constructed there.

Growth in Manitoba, Saskatchewan

At this time, it was reasonable to assume that the greater part of the oil for transportation would be received by the Interprovincial system at Edmonton. It was not anticipated that the pipeline would face the problem of receiving large volumes of oil as far east as Manitoba.

However, exploration in Alberta failed to make any other major discoveries after Leduc and Redwater fields until the great Pembina field opened up in 1954. In the interval, geologists began to work toward southeastern Saskatchewan and western Manitoba. In 1951 a considerable quantity of oil was discovered near Virden, Man. This oil was lower in gravity and not as good in quality as the Redwater and Leduc crudes but, basically, a good crude oil.

Virden field was near the Interprovincial Pipe Line and arrangements were made to receive the oil at Cromer and inject it in the passing stream. The first oil was received in October 1952 at the rate of 362 bbl. per day. These early injection rates did little to interfere with the normal operation of the line and two 5,000-bbl. tanks were sufficient to handle storage.

This relatively low volume was soon increased by additional discoveries—particularly in southeastern Saskatchewan and southwestern Mani-

STATIONS

toba. New fields at Nottingham, Alida, Steelman, Weyburn Midale, Daly, Frobisher, Halbrite, and other areas were developed and continue to develop.

Saskatchewan is presently regarded as one of the hottest areas on the continent. Production for the province as a whole has jumped from 16,000 bbl. in 1945 to an estimated 35,000,000 in 1957. As of July 5, there were 2,831 wells capable of production and a total of 1,500 to 1,700 new wells are forecast for 1957. The success ratio has been very high, especially in the southeastern section of the province where a producer is brought in for every 1.8 holes drilled.

Additional facilities were required at Cromer to handle this greatly increased volume. In rapid succession, three 24,000-bbl. tanks, five 55,000-bbl. tanks, and three 96,000-bbl. tanks were constructed. A fourth 96,000-bbl. tank is under construction at Cromer. These give Cromer a tank capacity of close to three-quarters of a million barrels of oil—a far cry from its early days as a simple booster station.

Pipeline Pumps Three Streams

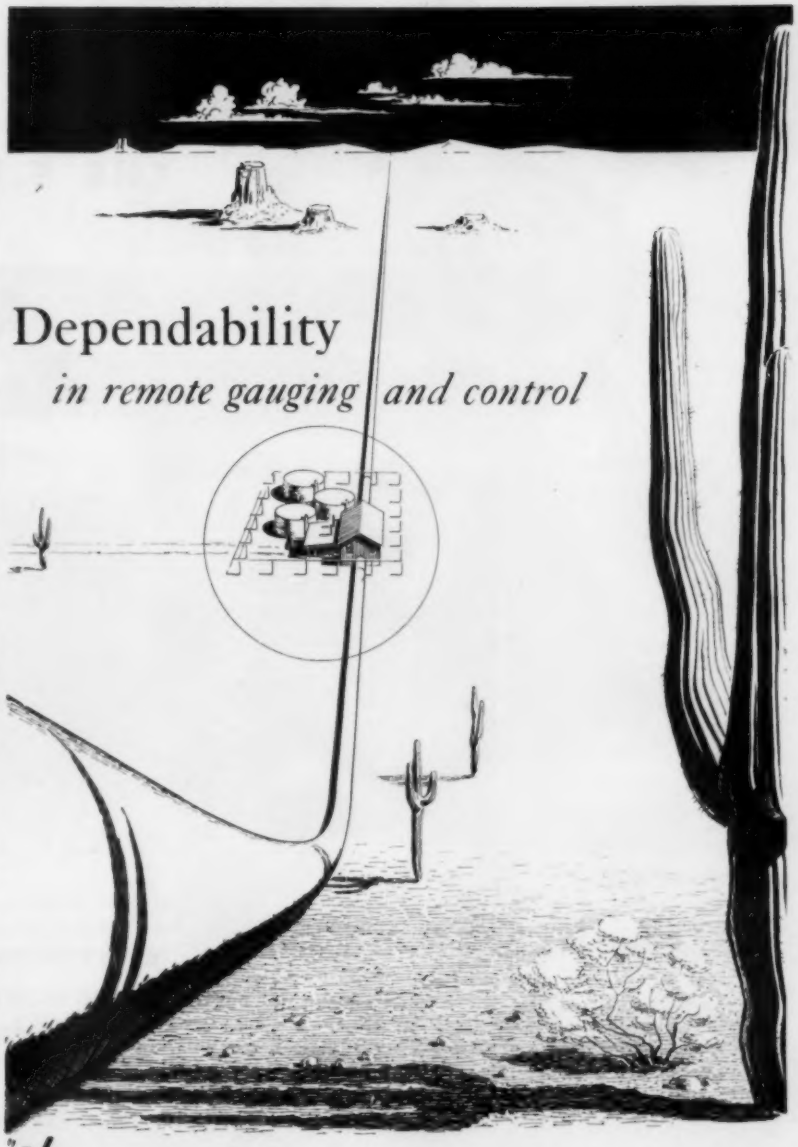
From Edmonton, Interprovincial Pipe Line pumps three streams—the Redwater stream which, except for small additions, is from Redwater field; the Leduc blend, consisting of Leduc crude plus proportions of other compatible crudes; and the mixed blend, consisting principally of Pembina with smaller proportions of other crudes.

It was into this mixed blend that the Virden crude was injected in the early days of the Cromer operation. Although every effort is made within the system to keep the composition of the mixed blend as consistent as practical, there is no control over the composition of the various streams received at Edmonton.

Interprovincial Pipe Line Co. decided to provide tankage, lines, and manifolding facilities to permit storing and batching some of this crude out of Cromer.

Breakout Tankage

Originating batches at an intermediate station on a pipeline brings problems in operations. To keep the facilities operating at maximum efficiency, breakout tankage has been provided where the batch is originating. Thus the upstream line can be kept in operation and continue to move oil down the line for accumulation in the breakout tankage while the originating batch is being pumped. Tankage has been provided to segre-



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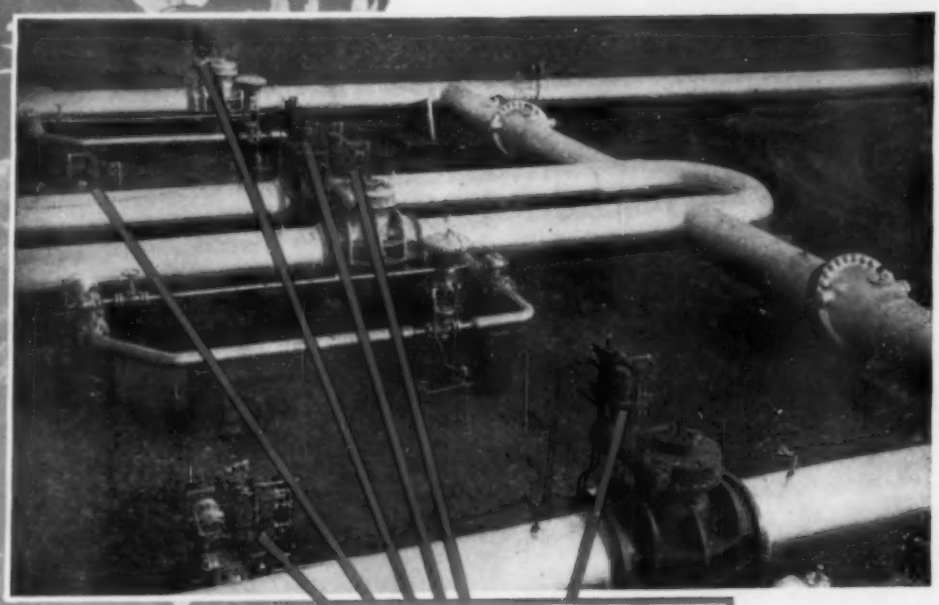

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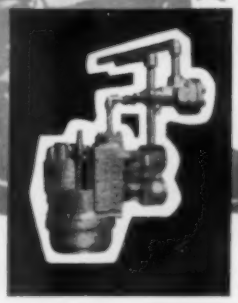

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gate the various types of crude received at Cromer.

Three types are received from the gathering lines. These are the light Manitoba blend which comes in at about 16,000 bbl. per day; medium or Midale blend at 7,000 to 10,000 bbl. per day; and the southeast Saskatchewan light blend at about 50,000 bbl. per day.

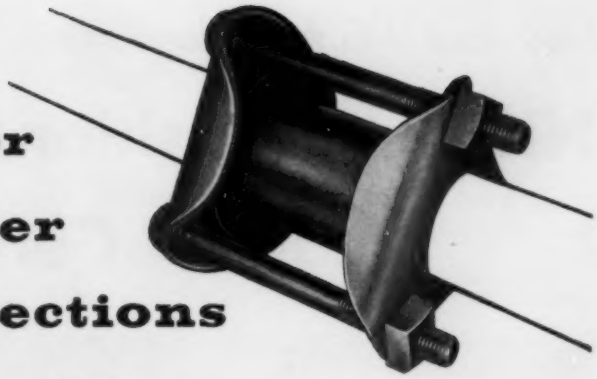
Trans Prairie Pipe Line was the first to operate gathering lines in this area and delivers oil from the Virden Daly fields. Later the Westspur system was built to serve the fields developing in southeast Saskatchewan. A portion of the Westspur lines have been looped within the past year to more than double their capacity. In addition, Trans Prairie Pipe Line has recently built a connection between the Weyburn fields and the Westspur Midale terminal. These two pipeline companies are now delivering approximately 75,000 bbl. per day to Cromer.

How Blends Are Handled

The light Manitoba and Midale-type crude go out as separate streams to the St. Paul area and as a combined blend to a refinery at Wrenshall. A refinery in Sarnia takes the southeast Saskatchewan light batches as a separate stream. The remainder of the light Manitoba and the southeast Saskatchewan light is injected into the Alberta mixed blend as it passes Cromer station.

An elaborate manifold and pump booster station has been designed to provide maximum flexibility in the operation at Cromer. The proportional injection is controlled by pneumatic flow controls which provide the desired blend. A system of motorized valves at the tanks and manifold and pneumatically operated valves at the manifold makes it possible to deliver the desired blend from any combination of tanks in the system to either of the two pumping stations now operating. One is on the original 16-in. line and the other on the new 24-in. line.

Saskatchewan and Manitoba crudes enjoy a definite transportation advantage on the eastern market as they are, on the average, 500 miles closer to the market than Alberta oils. Cromer is now handling the volume planned for the original line. There is every indication that Saskatchewan and Manitoba oil will continue to move to the eastern markets from Cromer in increasing quantities to add to the new importance of this one-time booster station on the world's longest crude-oil pipeline. **End.**



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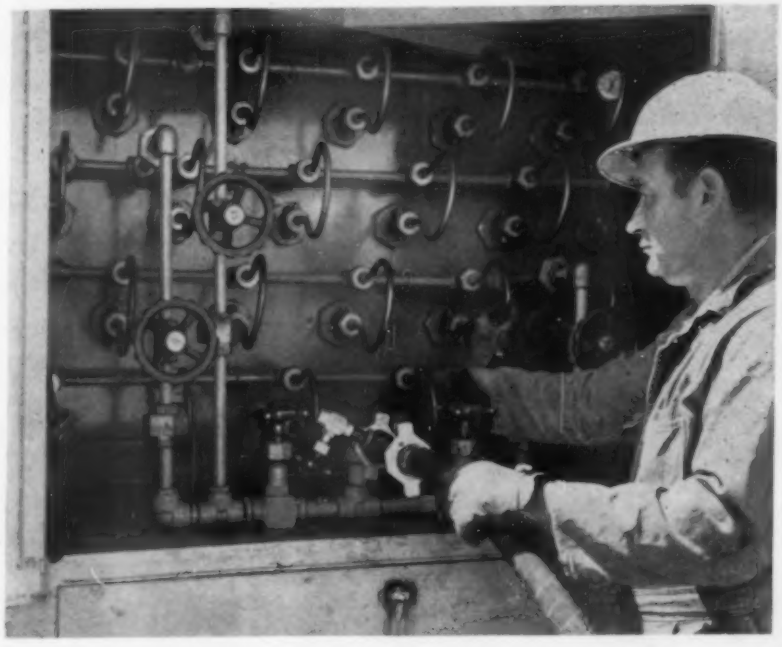
Easy does it in formation testing

Nitrogen Cushions Pressure Shock, Aids in "Gentle" Completions

By D. H. Stormont
District Editor

1. This well is being readied for the nitrogen treatment



2. . . . as operator controls flow of gas into pipe

USE OF A nitrogen cushion in formation testing, instead of the usual water or mud load, has been greatly expanded during recent months in California oil fields.

Since the method was introduced in the San Joaquin Valley area about 2 years ago it has been used on hundreds of tests throughout California.

Principal reason for the expanding use of a nitrogen or "air" cushion is that it avoids placing any shock on the potential producing formation. When the tester is opened the pressure differential between the formation and the drill pipe is absorbed by the nitrogen cushion. Pressure then can be slowly bled off so that the well is brought in gently.

This feature has resulted in oil wells being completed in holes that had been abandoned after conventional formation tests failed to reveal any oil shows.

Source of nitrogen . . . When the method was introduced by Bloom Air-cushion Corp., Bakersfield, commercial nitrogen was used. This required long hauls from the supply source.

Now an inert gas is produced in a new Bakersfield plant. Natural gas is burned with excess quantities of air in an inert-gas generator, under carefully controlled temperature conditions. After being thoroughly scrubbed and all moisture removed, the gaseous mixture is compressed in three stages to 2,400 psi. for loading into trailer-mounted tanks. Composition of the gas is in the order of 89 per cent nitrogen, 10½ per cent carbon dioxide, and ½ per cent oxygen.

Thirty tanks, holding 42,500 cu. ft. of nitrogen at 2,400 psi. and 72° F., are mounted on a trailer (Fig. 1). The 0.35-in.-wall cylinders (0.51 in. at the bell) are A.S.M.E. tested for a 4,000-psi. working pressure and have passed ICC Bureau of Standards tests. Relief valves on both ends of each tube are set to pop at 3,750 psi. in

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For nearly 15 years Sikorsky helicopters have been man's most versatile vehicles. Today they are among the most widely-flown, as well, serving the oil industry, airlines, and other commercial or military users on every continent, in 23 nations.

Solid reasons lie behind this wide acceptance. Experience is one. The world's first production helicopter was a Sikorsky, the R-4 of World War II. Since then Sikorsky has maintained unquestioned leadership of the rotary-wing field . . . leadership based on experience, on unmatched research, test and manufacturing facilities, on continuous design, development and production.

Offshore in the Gulf of Mexico, in jungles and other primitive areas, Sikorsky helicopters have a vital part in oil industry activities, saving time and cutting high transport costs wherever they fly. For more information on these versatile aircraft contact Lee S. Johnson, general manager, Sikorsky Aircraft.

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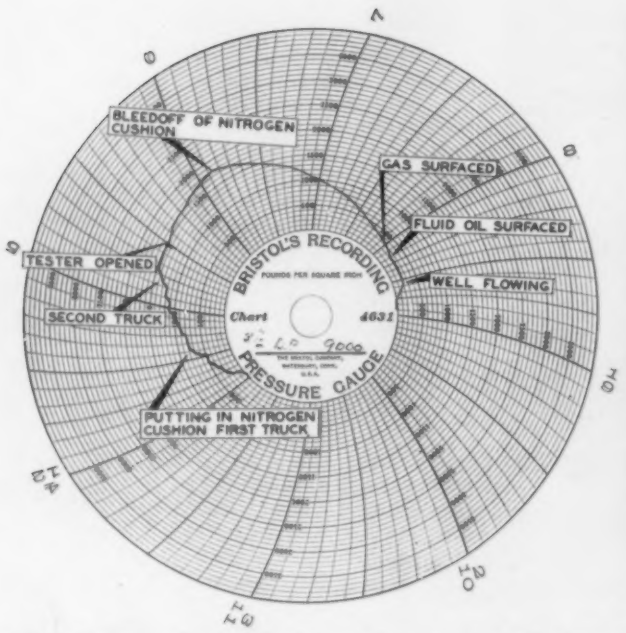
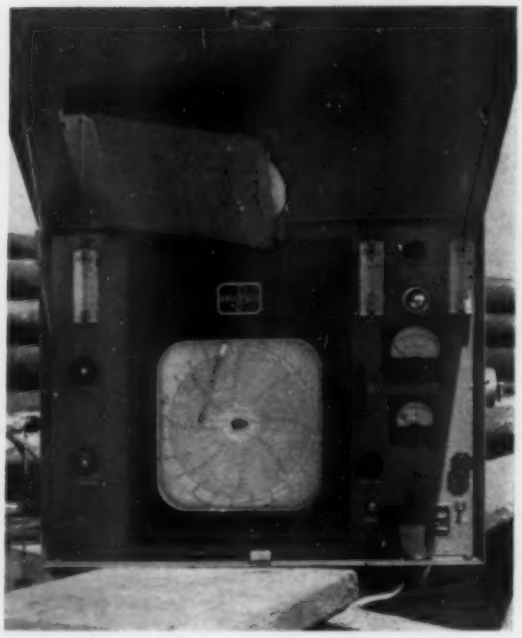


TYPE RECORD made while carrying out a formation test with nitrogen cushion. Fig. 3.



GAS ANALYZER used in connection with pressure recorder determines when formation gas is coming. Fig. 4.

the event pressure builds up due to some unforeseen cause.

Volume of nitrogen contained in the cylinders is equivalent to 255 cu. ft. of water displacement. A header at the rear of the trailer permits gas from any or all tubes to be fed rapidly into the drill pipe (Fig. 2).

Placing the cushion . . . After a truck reaches the well site, only 10 to 20 minutes are required to inject sufficient gas to bring the drill-pipe pressure up to that anticipated when the tester is opened. Normally one trailer load is sufficient to pressure wells as deep as 6,000 ft. The volume required, however, also depends upon the size drill pipe and the pressure the operator desires to use.

After the drill pipe has been brought to the desired pressure, the tester is opened. A few minutes are allowed for pressure conditions to balance, after which the nitrogen cushion is slowly bled off. This is continued until gas or fluid surfaces, or until pressure is exhausted and the drill pipe is pulled to determine results of the test.

A typical recording of a nitrogen-cushion formation test is shown in Fig. 3. In the case shown, 3½-in. drill pipe was run to 9,000 ft. The point at which the tester was opened, how pressure built up slightly, where bleeding started, and when the gas surfaced are readily seen.

Gas analyzer used . . . In addition to the recording of time and pressure used in making the test, an analyzer housed with the recorder checks the gas coming from the well. From its analysis the operator can determine whether the gas is combustible gas from petroleum, or if it is noncombustible gas.

The analyzer, shown in Fig. 4, gives a 3 to 5-minute warning before the full load of gas surfaces. An indicator on the instrument automatically lights up when the sampled gas stream from the well becomes combustible gas. This enables the operator to prepare for the flow. The analyzer also gives an indication of when the gas flow is of such volume that a flowing well is likely.

Better formation tests . . . Because the nitrogen cushion acts to eliminate the shock which normally occurs when the tester is opened, the method permits more reliable formation tests. It also results in a higher percentage of successful tests in formations where it normally is difficult to make a satisfactory drill-stem test.

In low-pressure formations—where as little as 100 ft. of water load might kill any flow into the tester—the nitrogen cushion has been particularly successful. There is no shock to break down the formation when the tester is opened. Gradual reduction of the pressure then permits a gentle flow from the formation into the drill pipe.

Better completions . . . Ability of the method to permit wells to be brought in gently has resulted in abandoned dry holes being recompleted as flowing oil wells, and in flowing wells being completed in areas where all recent completions had been pumpers.

One San Joaquin Valley well which had been abandoned in 1949 was reentered last year on the chance that an oil sand being produced in nearby wells had been overlooked. A 200-bbl. flowing well was brought in following the successful formation test with an air cushion.

Two other valley wells abandoned in 1951 and 1952 likewise were converted to producers after the plug was drilled out and the hole cleaned. No oil shows resulted from the original drill-stem tests but flowing wells followed the nitrogen-cushion tests. Earlier this year they were still flowing 110 to 140 bbl. of fluid daily, respectively, after having been on production more than a year.

Less plugging . . . Ability of the method to bring wells in gradually also is shown by experiences in wells producing oil with a high sand cut. One successful test resulted in a 1,700-ft. rise of oil, cut 60 per cent with sand. In a test without the nitrogen cushion, the shock of opening the tester probably would have resulted in its being immediately plugged.

Use of nitrogen-cushion formation testing recently spread to West Texas. There Cook Nitrogen Service, which has been licensed to supply the service outside of the five Pacific Coast states, has four units in use. Bloom has seven truck-trailer units at work in California. **End.**

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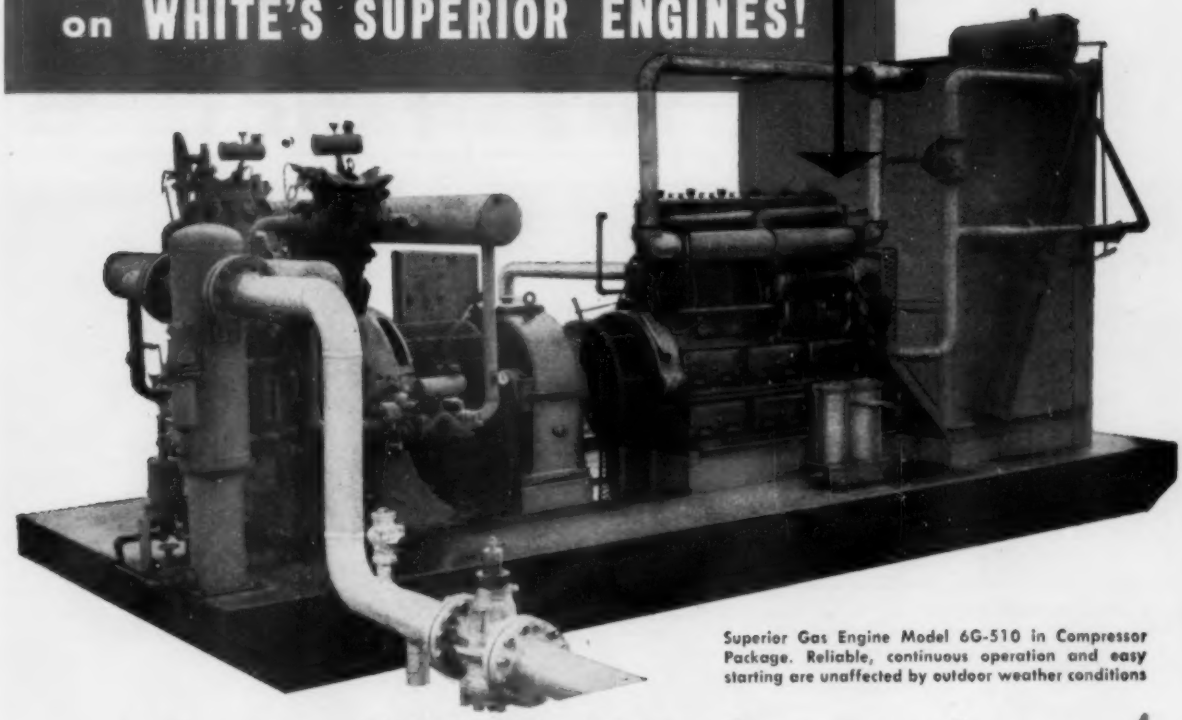

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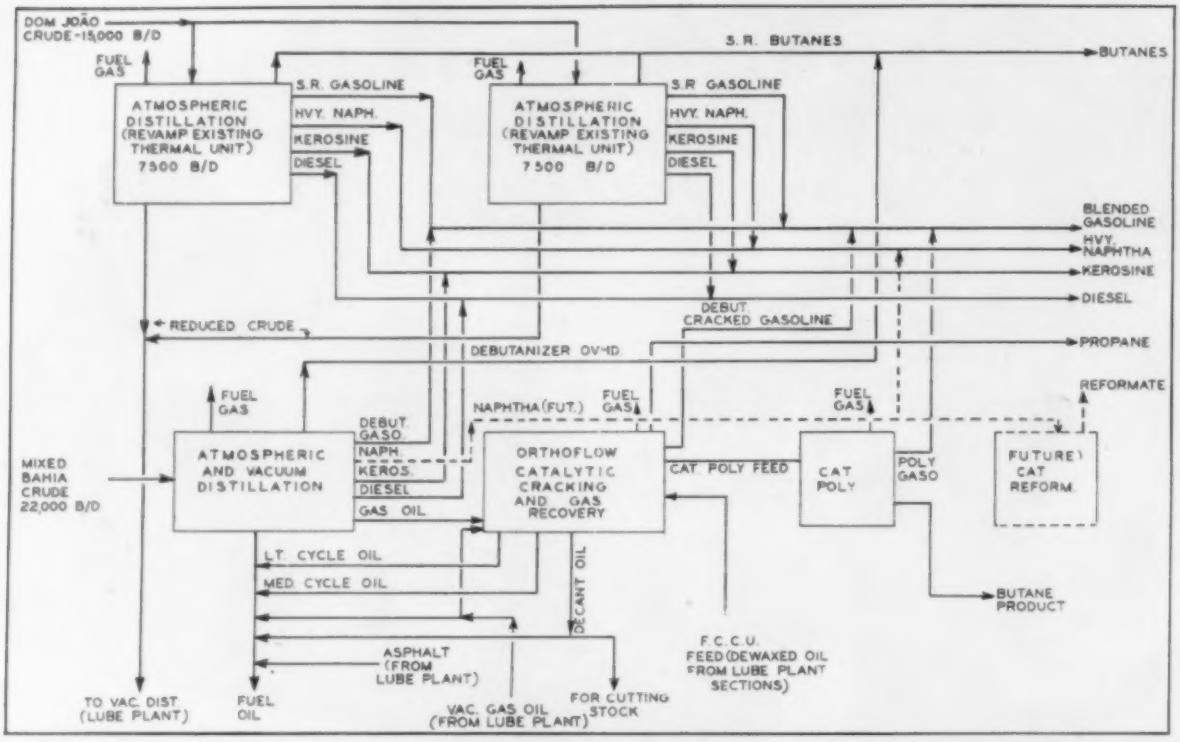


LIGHT-OILS PROCESSING—At the Mataripe refinery of Petroleo Brasileiro, S. A., units are designed to operate on domestic Brazilian crude oil. Existing thermal cracking facilities are being revamped to crude units operating on Dom Joao crude. Additional atmospheric and vacuum units will run on mixed Bahia crude. A model "B" Orthoflow cat cracker is being installed. Fig. 1.

Petrobras Expanding Mataripe Refinery

Plant will operate on domestic Brazilian crude, marking a "first"

By John C. Reidel
Petrochemical Editor

PETROLEO BRASILEIRO, S. A., Brazilian government controlled oil company, is presently directing a $50,000,000 expansion program of its Mataripe refinery located near Salvador (Bahia). This is one of the largest refinery projects of its kind in terms of diversity of facilities being constructed at one time. The new complex facilities will include crude-distillation units created by revision of existing combination thermal cracking units; new atmospheric and vacuum distillation units; a new catalytic cracking unit; and extensive lube and wax-processing facilities. Crude throughput is being stepped up from the existing 5,000 bbl. daily to a total of 37,000 bbl. per day.

Aside from its size, multiplicity of units, and complexity of processing, this expansion is of particular interest for these reasons:

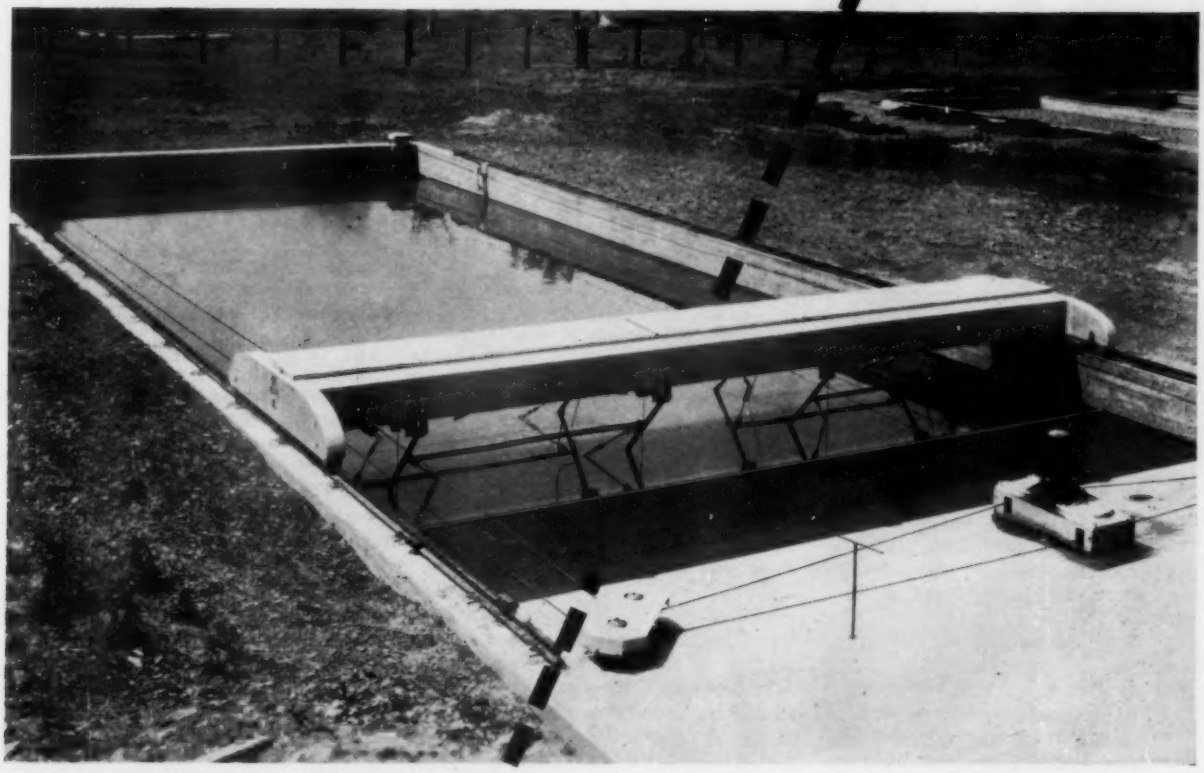
- Units are designed to operate on domestic Brazilian crude oil, the first large-scale facilities so designed in Brazil.
- The waxy domestic Dom Joao crude oil has properties that make it unusually suitable for lube-oil and wax manufacture. It has been termed "the Pennsylvania oil of South America."
- Most interesting nonconventional feature in the lube-oil processing is the use of a Podbielniak centrifugal extractor in place of the conventional countercurrent solvent extraction tower.

Original facilities of the Mataripe refinery went on stream in 1950. These were a combination crude distillation-thermal cracking unit of 2,500-bbl.-daily capacity plus complete offsites. A 180-bbl.-daily cat poly unit was installed to handle the gases from the existing and projected duplicate facilities in 1953. The same year the second combination thermal cracking unit of 2,500-bbl.-daily capacity was installed. This was provided with vacuum-flash facilities and a revision was made from atmospheric to vacuum flash in the original thermal cracking unit to obtain better fuel-oil reduction.

All of these facilities, and the units in the large expansion now under way, were designed and engineered by M. W. Kellogg Co. The new facilities are being erected by Petrobras. The list of new facilities includes:

1. Two crude-topping units to operate on Dom Joao crude. These are a revamp of the existing thermal cracking units, and will have a total capacity of 15,000 bbl. per day throughput.
2. Atmospheric and vacuum distil-

"POSITIVE OIL REMOVAL IN REFINERY WASTE TREATMENT"



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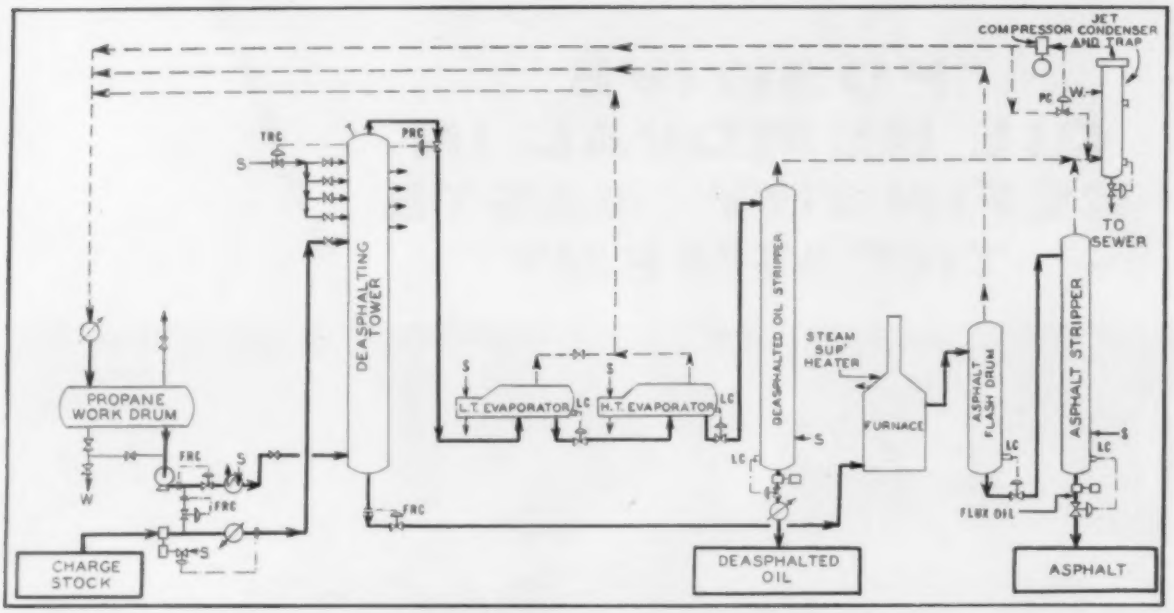

PROPANE DEASPHALTING—Vacuum resid goes to this conventional Kellogg propane-deasphalting unit. The Dom Joao crude used for lube manufacture gives high yields of high-viscosity-index oils and low extracts. Fig. 2.

lation units for a charge of 22,000 bbl. daily of mixed Bahia crude.

3. An 18,000-bbl. per day (total feed) model "B" Orthoflow catalytic cracking unit and gas-recovery system.

4. Revamp of the existing 180-bbl.-daily unit for butylene and construction of a new 500-bbl. per day cat poly unit.

5. A vacuum-distillation unit in the lube plant designed for a feed of 8,500 bbl. daily to make lube-oil stocks.

6. A propane deasphalting unit.

7. A phenol solvent extraction unit in which Podbielniak centrifugal extractors are used in place of the conventional treating tower.

8. Propane dewaxing and deoiling facilities.

9. Wax-distillation and wax-percolation units.

10. Separate marine terminal facilities for both crude oil and products storage and loading on Madre de Deus Island located 4-5 miles from the refinery. Loading facilities here will accommodate T-2 tankers. A portion of this terminal has already been put into operation for loading of crude oil.

11. Facilities for manufacture of a wax modifier.

12. Provisions are being included also for the possible future addition of gasoline and kerosine-sweetening facilities, catalytic reforming, and additional propane deoiling.

1. Light-Oils Processing

The new Mataripe process units are primarily designed to operate on Brazilian crude with alternate design for imported Kuwait oil. Fig. 1 indicates light-oil processing for the expanded Mataripe plant. Crude distillation will be accomplished in two separate sections of the plant.

Dom Joao crude . . . One section consists of two 7,500-bbl.-daily atmospheric-distillation units revamped from thermal cracking and operating on the low-sulfur-content, waxy Dom Joao crude oil. Existing lines and heat-exchanger systems are being utilized as far as possible. In each of these two revised crude-distillation systems, Dom Joao crude will be routed through the existing combination furnace to the primary crude tower and secondary crude tower, operating in series. Bottoms from the primary crude tower will go to vacuum distillation in the lube plant; in the secondary crude tower a gasoline cut will be taken overhead, two sidecuts are made—heavy naphtha and kerosine, and diesel bottoms.

Mixed Bahia crude . . . Mata and Catu mixed crude will be charged to new crude atmospheric and vacuum units. These will furnish gas oil to the cat cracker. Feed to the cat cracker will include also vacuum gas oil and by-products from lube-oil and dewaxing operations, as indicated in Fig. 1. The cat cracker is designed to handle 12,000 bbl. per day of fresh feed and 6,000 bbl. daily of recycle.

Gas-recovery facilities are being installed for maximum recovery of propane and butane. The gas recovery system includes an absorber-stripper handling cat fractionator overhead gas, and a secondary absorber. Condensed overhead is used as the absorption medium in the primary absorber and light cycle oil for the secondary absorber. Bottoms from the stripping section of the absorber-stripper will go to the debutanizer. This will then make debutanized gasoline bottoms and the overhead will go to a C_3-C_4 splitter. The splitter is being installed to make propane and butane L.P.G. since this is becoming a very important product in Brazil. Accordingly, the gas-recovery plant is designed to recover nearly all the C_4's and 90 per cent of the propane-propylene. Butane-butylene bottoms from the stripper will go to the cat poly unit and the overhead propane-propylene stream to DEA treating.

With the addition of a new cat poly unit, a total of 2,200 bbl. per day of cat poly feed provided by the cat cracker can be charged on a split arrangement to one of the two cat poly units. Consideration has also been given to the future installation of kerosine and gasoline-sweetening facilities, if necessary. A catalytic reforming unit is planned for the future.

2. Madre de Deus Terminal

Gasoline-blending facilities and provisions for adding TEL and inhibitor are available at the refinery. However, there will be no products storage facilities at the refinery. Such storage will be provided at the Madre de Deus island terminal and con-

MORE EFFICIENT RESULTS!

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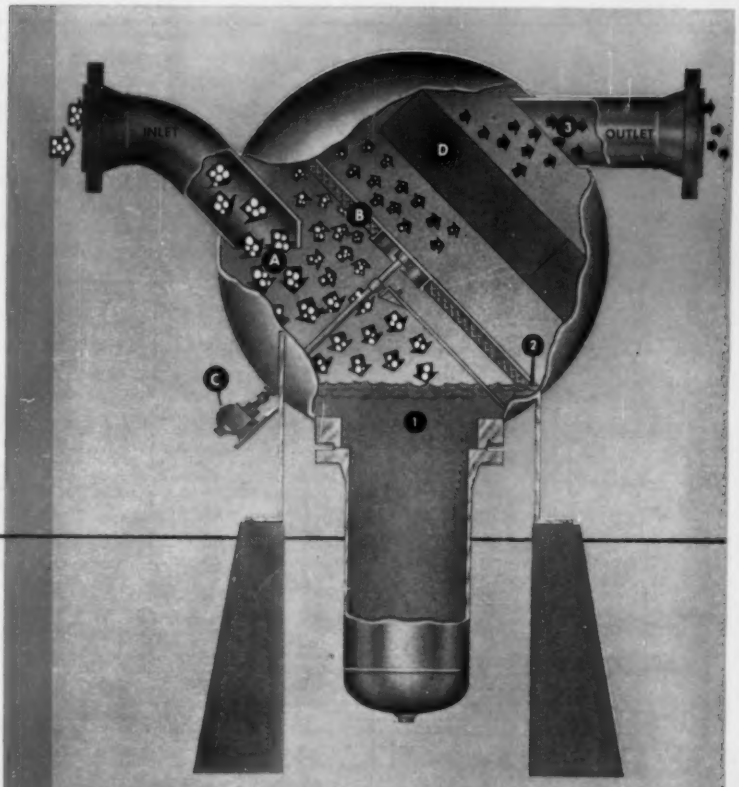
*Spherical scrubber for dust and liquid removal from gas flow

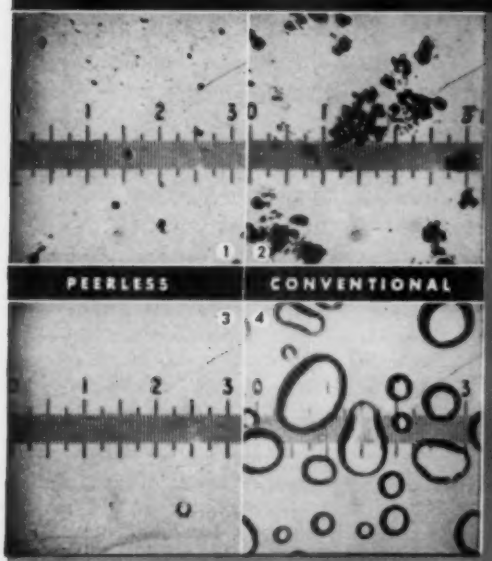


(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving through liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self-cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 181

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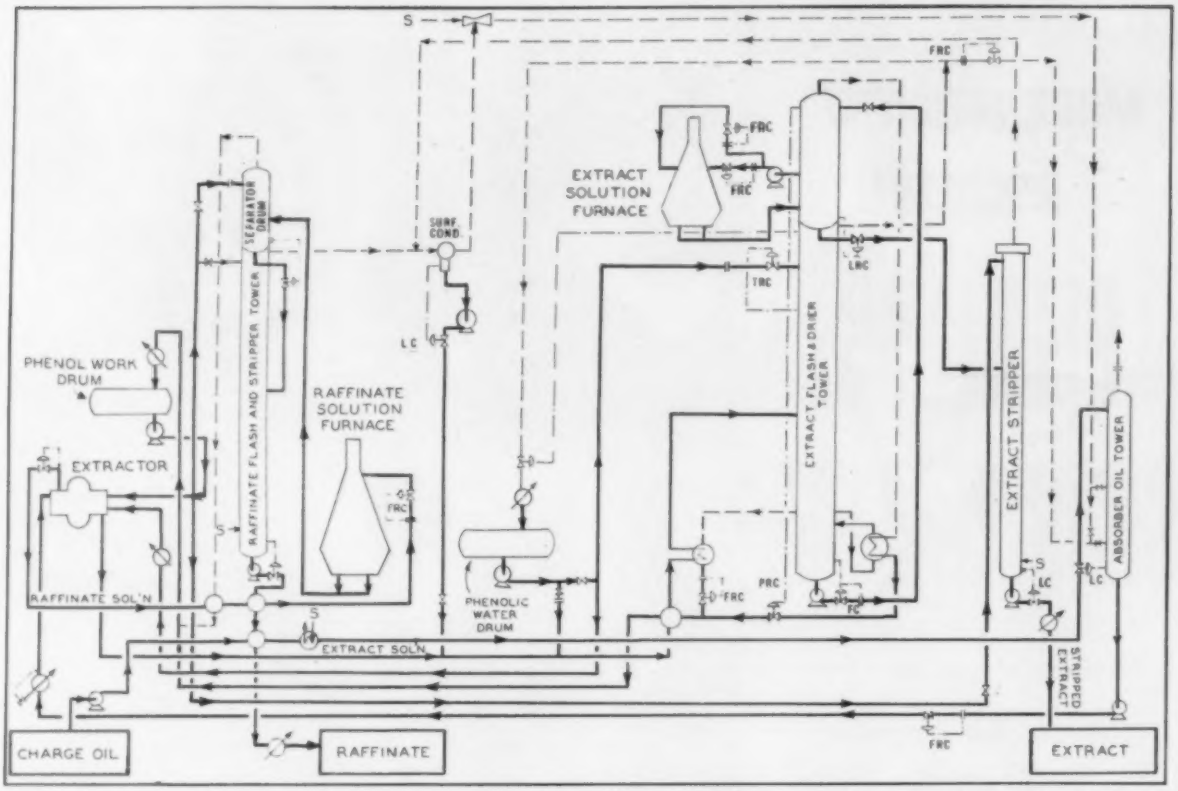

PHENOL EXTRACTION—This unit can handle an average charge rate of 6,300 bbl. per day. With Dom Joao oils a low phenol-to-oil ratio is possible, ranging from 1/1 on light neutral to perhaps 1.5/1 on medium neutral. Fig. 3.

nected to it by products pipeline. Here, 30-day storage will be provided for all products except waxes. These latter will be packaged at the refinery and shipped by barge or truck. Small truck-loading facilities for light products will be provided at the refinery. A total of 46 standard 10-ft. and 60-ft. L.P.G. bullets will be located in an isolated storage area at the Madre de Deus terminal.

T-2 tankers . . . Maximum over-all flexibility has been designed into the loading facilities at the terminal. The large T-2 tankers can be loaded and there is also a barge-loading station. Special L.P.G. tankers will be used and butane also will be loaded on barges. Lube oil will be loaded aboard a coastal-type tanker at the T-2 load points. Design of loading facilities is such that two T-2 tankers and four light-product barges can be loaded simultaneously; or T-2 tankers or barges can be loaded in various combinations simultaneously with one butane barge and one L.P.G. tanker.

Crude storage . . . Another feature of the Madre de Deus terminal installations is the provision of large storage tanks for crude oil. One crude-storage tank is now installed, with one or more to be added. Main crude storage is located at the refinery. As Mata and Catu oil fields are developed, additional crude-oil tanks may be erected. Crude oil will be pumped directly from the fields to these tanks. A temporary submarine offshore loading line has been provided for loading crude oil aboard tankers. Imported crude, if it should be used, can be unloaded from T-2 tankers to the crude-storage tanks. The Madre de Deus terminal is equipped with a boiler plant and other utility distribution equipment. Electric power and fresh water are supplied from the refinery.

Tying in new facilities . . . In the process of putting the new facilities on stream, it will be extremely important to maintain existing refinery capacity as much as possible and to erect new units with minimum interruption of existing operations. Therefore considerable detailed planning is being done to make the switchover as efficiently as possible. Construction jobs are being lined up in sequence and carefully planned programs for switching of tanks, etc., is being drawn up. Temporary rundown lines will be provided so that tanks can be switched in service as required; final product tanks, for example, will be used temporarily as rundown tanks. The aim is to maintain deliveries out of the plant at twice the previous shipping rate as new facilities are tied on.

"The waxy domestic Dom Joao crude oil has properties that make it unusually suitable for lube-oil and wax manufacture. It has been termed the Pennsylvania oil of South America."

3. Lube-Oil Processing

Dom Joao reduced crude from the two 7,500-bbl.-daily atmospheric-distillation units (revamped thermal-cracking units) goes to the lube-oil section. A single-stage 8,500-bbl.-daily vacuum unit handles this reduced crude. Products of vacuum distillation are vacuum gas oil which is returned to the light-oils section as cat cracker feed, spindle oil cut as required, light and medium neutrals, and vacuum bottoms.

Propane deasphalting . . . Vacuum residuum goes to a propane deasphalting unit (Fig. 2) of conventional Kellogg design. Asphalt from the propane deasphalting unit goes to refinery fuel oil.

The Dom Joao crude used for lube manufacture at Mataripe is a most unusual crude. It gives high yields of high-viscosity-index oils and low extracts; at the same time it has a high wax content and also makes some asphalt.

Phenol solvent extraction . . . Viscosity-index improvement to 95 and improvement in color, oxidation resistance, reduced carbon residue and sludge-forming tendencies, are obtained by phenol solvent extraction. Fig. 3 is a simplified flow diagram of the phenol solvent-extraction section at Mataripe. The unit can handle an average charge rate of 6,300 bbl. per day. With Dom Joao oils a low phenol-to-oil ratio is possible, ranging from 1/1 on light neutral to perhaps 1.5/1 on medium neutral. Tentative yields, based on charge, may be: Spindle (when made) — 94 per cent; light neutral—92 per cent; middle neutral—87 per cent; deasphalted oil (bright stock)—95 per cent.

Phenol treating is a countercurrent extraction process in which the phenol or heavy phase contacts the oil (light) phase, effecting highly selective removal of polynuclear aromatic molecules which have very low viscosity index and poor stability under engine conditions. Conventionally, this extraction has been done in towers, containing contacting elements or trays, effecting alternate mixing and separation of the phases in countercurrent fashion. Refluxing is induced by introducing water, or recovered phenolic water, below the oil inlet. This reduces the solubility of oil in the phenol, thereby rejecting from the extract phase the least-soluble oil molecules present to form a "reflux" stream.

In the Mataripe plant, Podbielniak centrifugal extractors will be used instead of the extraction tower. These extractors operate in a manner quite similar to the tower, except that the countercurrent flow is radially to and away from the center of the rotating drum. Contacting elements are provided for alternate mixing and separation of the phases, but because of the large centrifugal forces applied, they can be very closely spaced. Phenol enters near the center and flows radially outward contacting oil, which is introduced near the periphery of the drum. Phenolic water is introduced to create refluxing near the periphery and raffinate is withdrawn at the center while extract is withdrawn from the periphery. Raffinate and extract solutions are treated conventionally for the recovery of solvent.

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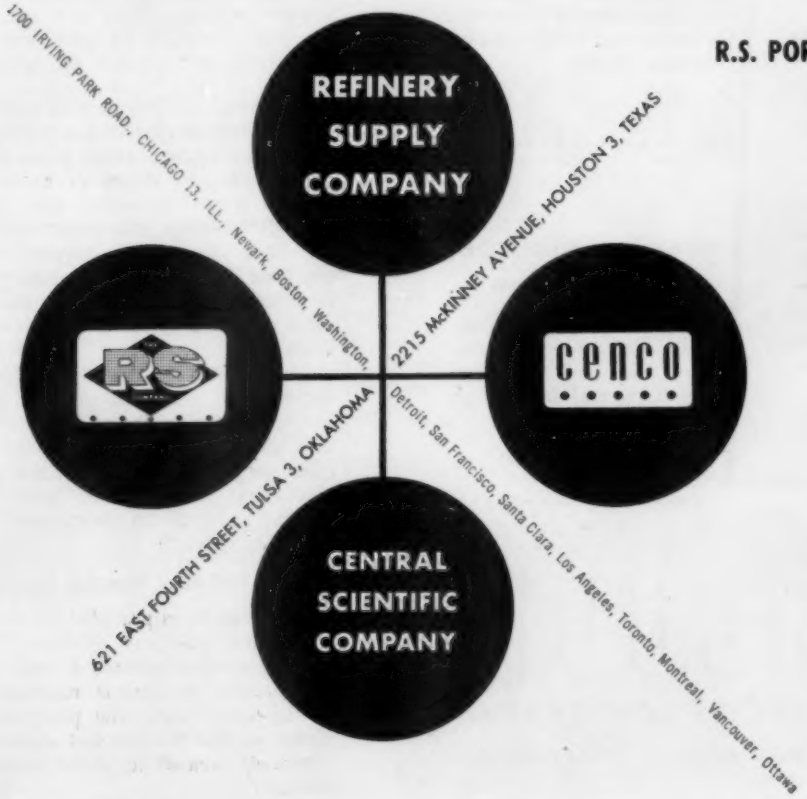
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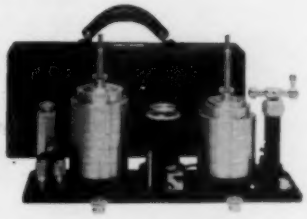

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4. Dewaxing

Propane dewaxing and deoiling facilities are being provided to reduce all lubes to 0° F. pour point and to make 60 tons per day of paraffin wax. Alternatively, microcrystalline waxes may be made. Propane dewaxing will be employed with batch refrigeration on automatic cycle control and continuous filtration. Two chillers will alternate on the chilling cycle. As pressure is reduced, propane flashes to the equilibrium temperature. The propane is recompressed and condensed for recirculation.

The chilled batch consists of oil, propane, and wax crystals. It is transferred into the filter feed drum. The process now becomes continuous again with filtration on a rotary drum filter which is sprayed with propane ("wash" propane). Filtration results in a filtrate which is a solution of oil in propane and a "slack" wax cake of low oil content.

Wax recovery . . . The wax solution is exchanged against warm propane going to the chiller. The wax solution then goes to the low-temperature and high-temperature evaporators in series where propane is evaporated at condenser pressures. The wax solution is then flashed at reduced pressure, vapor going to the compressor trap. The liquid wax solution then goes to a stripper where it is stripped with steam to take out the remaining propane. Liquid wax is taken from the bottom of the stripper.

Oil recovery . . . Dewaxed oil solution (filtrate) is collected in the dewaxed-oil-solution drum, then pumped through two stages of exchange against warm propane; and then through two-stage evaporators and to the flash drum and stripper. The overhead from the evaporators joins compressor discharge vapor and is condensed and returned to the work drum.

The overhead from the strippers, consisting of steam and propane, goes to a jet condenser. Steam is condensed in a direct-contact condenser and the overhead goes to the drier which provides dry propane that joins the streams going to the compressor trap and is compressed.

5. Clay Treating

Clay treating is provided for all dewaxed oils and wax products. The clay percolation process is used and incorporates continuous regeneration of the spent clay. The plant is designed so that the oils and waxes are separately treated to avoid contamination. **End.**

Assures control of paraffin viscosity

EPOLENE "N"

Viscosity control of paraffin formulations calling for the addition of polyethylene is assured—if Epolene "N", Eastman polyethylene wax, is used. Because uniformity of coating paraffins is so important, Eastman takes special care to produce Epolene between narrow limits of viscosity.

Published specifications for the viscosity of Epolene "N" are within the range of 2200 and 2700 cps at 125° C—your assurance of close control and uniformity from batch to batch.

The table shows what this uniformity means in polyethylene-based paraffin formulations. Five percent samples of Epolene "N", from the *extremes* of our production range, were mixed with paraffin—and the viscosities of the resulting mixtures were taken on the same Brookfield Viscometer.

Sample	Viscosity at 200° F (cps)
100% paraffin	4.8
95% paraffin—5% Epolene "N" (2250 cps)	7.5
95% paraffin—5% Epolene "N" (2700 cps)	7.6

Although viscosity varies from paraffin to paraffin, these results dramatize the advantage of using Epolene "N". Thus, for the paraffin under test, the maximum variation encountered in the final viscosity of the 5% Epolene blend was only 0.1 centipoise.

To assist manufacturers in taking full advantages of the outstanding properties of Epolene "N", Eastman maintains an extensive technical service laboratory in Kingsport, Tennessee. Through this laboratory, paraffin formulators are offered expert assistance in formulations and manufacturing techniques.

For samples and further information, write Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Chemicals Division, Kingsport, Tennessee.

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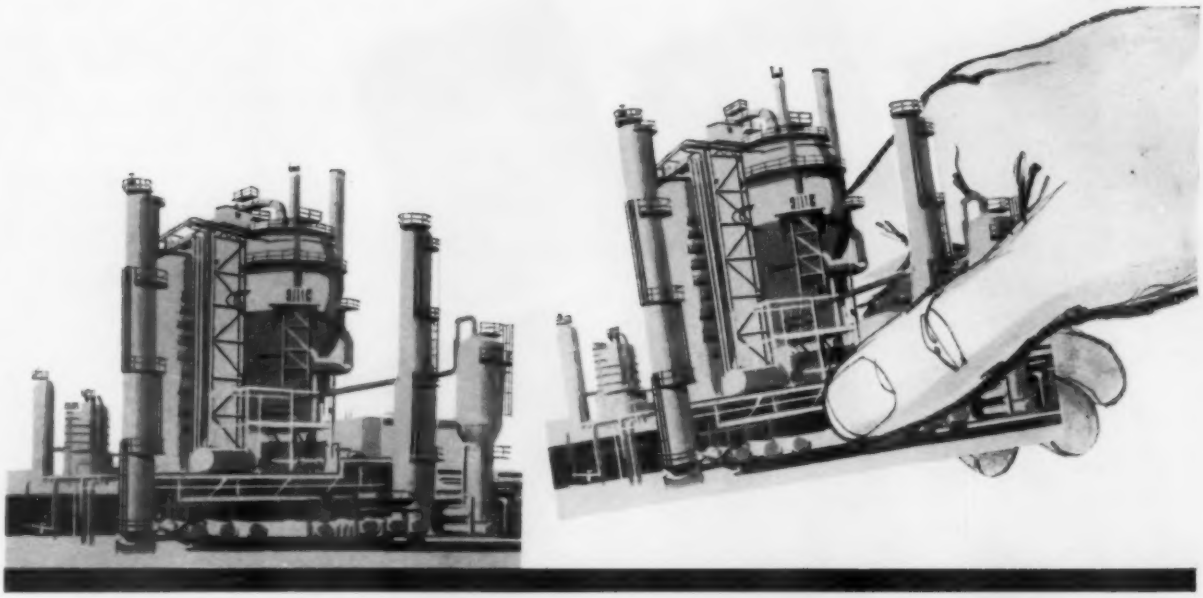

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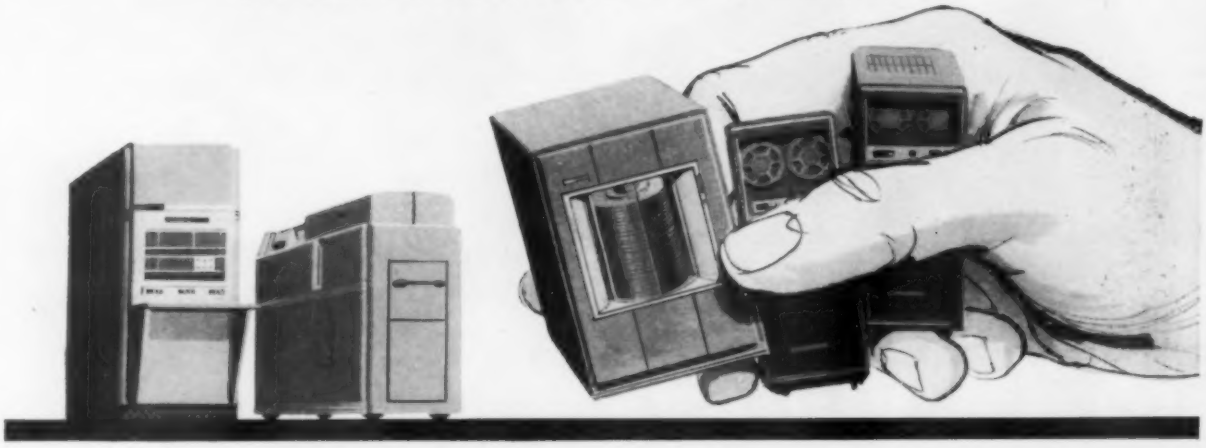

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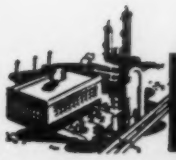


THE FOREMAN'S PAGE

Refining · Petrochem · Natural Gasoline

JOB IMPROVEMENT FOR THE PROCESS FOREMAN—102

WELL-LABELED SAMPLES have such information on the label as date and time of sampling, unit name, name of oil or stream, and test required if other than a routine sample.

Are Those Samples Properly Identified?

PROPER identifications on samples are very important. Some laboratories handle over 1,000 samples each day. Some samples may become lost but more often a sample is set aside at the laboratory because someone has failed to state what the sample is or where it originated. Frequently the missing information can be tracked down but this means extra work and delay. Some sample tags have color bands used by the laboratory.

Complete information on the sample tag will assure the return of lab results and will help the lab make this return promptly. Each sample tag should have the following information:

1. Date and time of sampling
2. Unit name and phone number if available
3. Name of the oil or stream
4. Test required if other than a routine sample.

Place the tags on the samples as they are caught. Marking corks and trusting memory frequently result in mixups.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

Interpreting results . . . Test results on samples not within the allowable limits of specifications are received frequently. This calls for a quick check of available information and data before making any changes in operation.

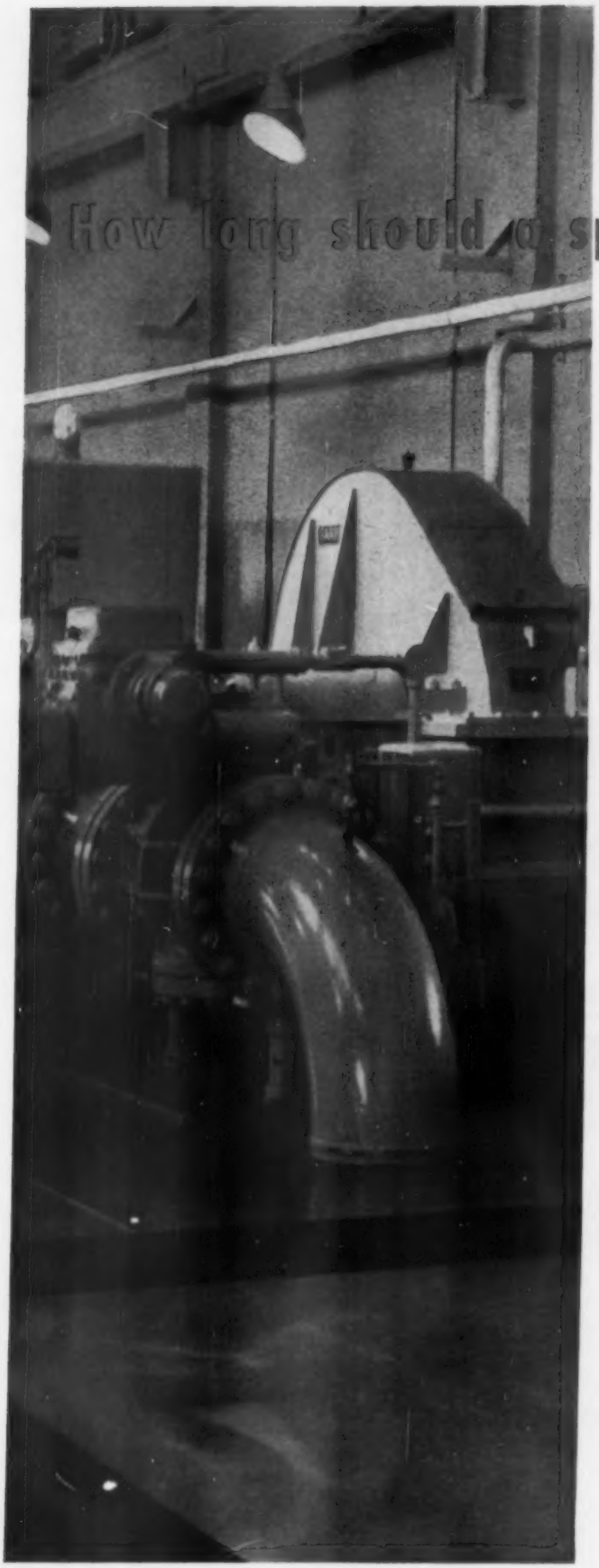
A single sample being off test may be evidence that something is wrong but we must look for additional support of this evidence by analyzing such possibilities as:

1. Changes in the operation that correspond with the time of sampling.
2. The unit gradually drifting away from a control point as shown by recording instruments and by previous tests on the same stream.
3. Changes in the test results on other samples from the same system which would show trouble of a general nature such as feed composition, fluctuations in steam or water supply, etc.
4. A valve left partly open caused by something caught under the valve gate.
5. A valve or cock left open through a mistake or misunderstanding.
6. Possible mechanical leaks or plugging up that might explain the trouble.
7. A possible laboratory error in reading or recording a number.
8. A mixup at the unit of catching and tagging the sample or at the laboratory in handling the sample.

What to do . . . If the examination of the operation being performed indicates no reason for the offtest results and a check with the laboratory shows no error in transmitting the results, then resample for a check on the tests. If a mechanical leak is believed likely, two or more samples may be required to pin point the trouble. All nonscheduled samples should be marked special.

When changes to the unit or operation being performed are needed, it is the operator's duty to make them. After changes are made and sufficient time has elapsed for the unit to line out, the streams in question should be resampled and retested.

The operating foreman is vitally interested when streams are off test. His counsel and advice are available whenever needed.



How long should a speed increaser last?

True, there is no firm and fast rule for predicting how long a speed increaser will last in pipeline service. There are, however, some dependable clues. Most practical of all is performance under actual operating conditions.

How do Farrel speed increasers measure up when this service yardstick is applied? The answer is on record: Since 1932, when the first of these units was placed in operation, not one has ever been taken off the job. *This indicates that the life expectancy — or average service life — of a Farrel speed increaser is not less than 25 years!*

Design features tell the story. For example, teeth are continuous across the full face width of each gear — paying off in bonus strength and load-carrying capacity. Oversize shafts guard against torsional deflections under peak torque variations. Shafts are mounted in husky, precision-finished bearings. The rigid housing preserves original alignment of moving parts.

When you're in the market for speed increasers, remember the extra stamina that's built into every Farrel unit. It's your assurance of long-range speed-increasing economy.

In the meantime, send for a copy of bulletin 448-A.

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FB-1109

By W. L. Nelson
Technical Editor

COST-imating

Index of COST-imating Data

THIS ARTICLE completes the new COST-imating series. Prices can, however, be currently brought to date by means of the Itemized Cost Indexes published each quarter (first issue of January, April, July, and October) in The Oil and Gas Journal.

So much cost information has now been published in the COST-imating series that the preparation of an index is complicated. In the tabulation on these pages, the numbers of the original COST-imating series are shown in parentheses after each item and the numbers of the new COST-imating series as plain numbers. In addition, the two series have been listed in two columns so that confusion will be avoided. Column labeled "Elsewhere" refers to articles published in The Oil and Gas Journal but not in COST-imating series.

New COST-imating Series Coming

Starting within the next few weeks, the Journal will present a new Nelson series on operating costs of individual process units. This will be developed to give eventually cost data for the entire refinery. These costs will be given in terms of investment, material, power, and manpower.

The present processing cost literature is not of much value, because each set of data has a different basis. Dates and locations vary at random. The new series will provide a common denominator for these costs by use of the Nelson Index.

These articles will appear in The Oil and Gas Journal exclusively—**don't miss them.**

Item and series number*—	Original series	New series	Elsewhere	Page No. in reprint§
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Acid treating equip., 30		5-13-57		31
Agitators (47)	9- 8-49			63
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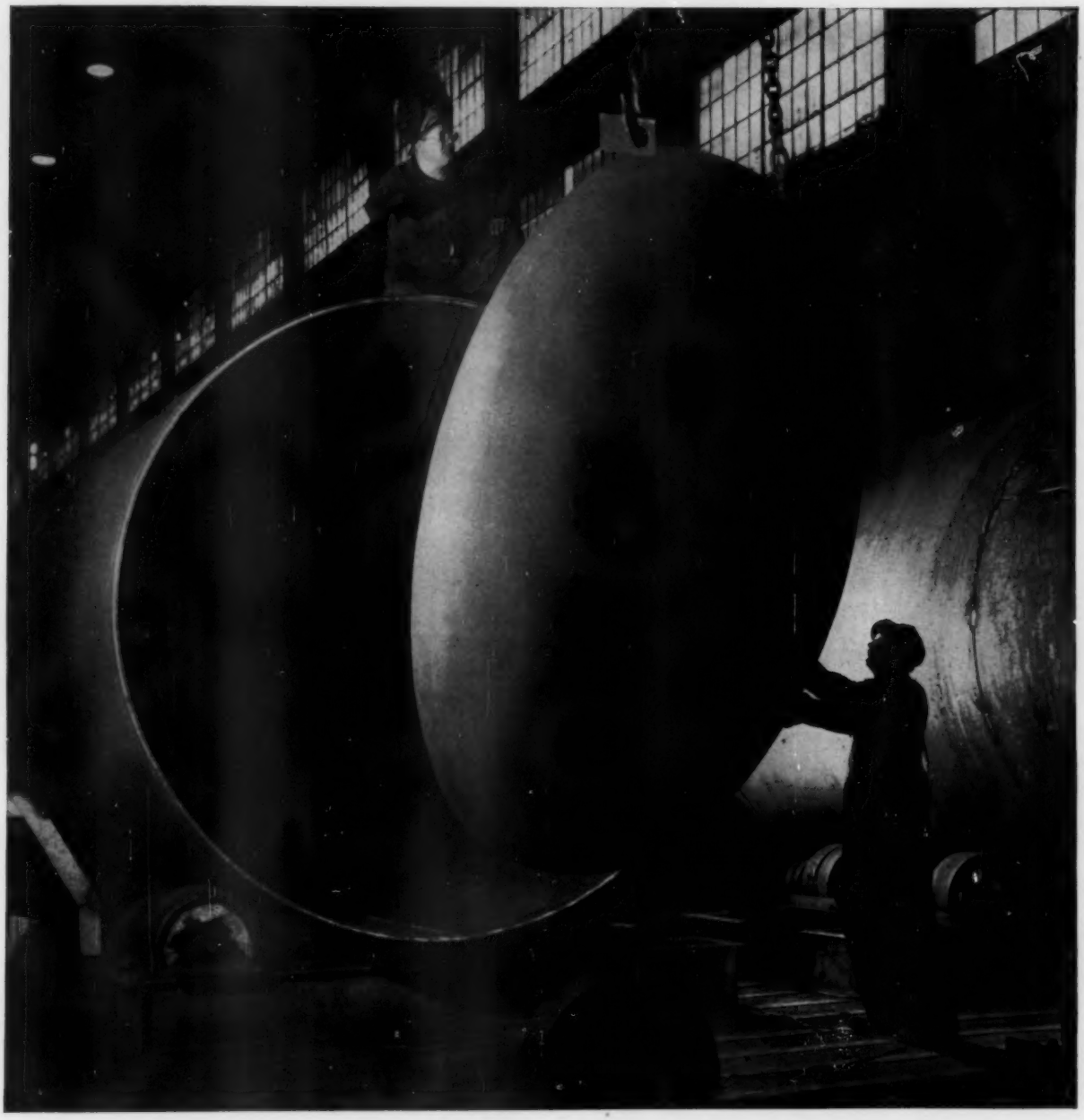

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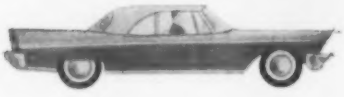

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Falcon Seaboard Makes Fast Time in Deep Test

Falcon Seaboard Drilling Co., Tulsa, made 14,785 ft. of hole in 145 days in a deep well it is drilling for British-American Oil Producing Co. in the Carter-Knox area, on the Stephens-Grady county line, in southern Oklahoma.

This averaged slightly less than 102 ft. of hole per day and set a new speed record for drilling in this deep field. The well, 1 Brickel, in 4-2n-5w, on the Stephens County side of the field, was spudded March 30. Hole was at the 14,785-ft. depth August 22. Time included cementing of 20-in. pipe at 120 ft., and 13-in. casing at 4,389 ft.

Hole now is down below 15,300 ft. in drilling to the lower Simpson zones from which the field has been found productive this year. Drilling is with a heavy-duty Bethlehem 1013 rig with a 142-ft. Lee C. Moore mast.

The Carter-Knox area, where shallow production was found in 1924, now is the scene of Oklahoma's deepest drilling and production. Production, gas and condensate, is from Bromide sands below 15,600 ft. Six wells already have been completed. Ten deep tests now are drilling.

Five different deep pay zones have been indicated, including the three Bromide sands already proved productive, and the McLish, and Oil Creek sands. The latter, the deepest, tested oil and gas at 16,630 ft. in British-American's 1 Kreiger, which now is drilling ahead about 17,300 ft.

Dillard & Waltermire, Houston, hold contract for a 15,000-ft. wildcat in Vermilion Parish, South Louisiana, for Sid Richardson Carbon Co. at 1 Leo P. Bonin, 14-11s-2w. The wildcat is just south of the Acadia Parish line. Nearest production is in West Gueydan field, 3 miles southwest, and 4 miles southeast at Gueydan field.

Howell, Holloway & Howell, Dallas, are starting a contract job in the St. John field, Lafourche Parish, southeastern Louisiana, which they opened last April with a 15,200-ft. gas-condensate well drilled under their own name. The contract operation is for Chacahoula, Ltd., at 1 Southdown, a 14,700-ft. test. Since completion of the discovery well, they have drilled another well under their name. It promises to confirm the discovery well's findings but completion has been delayed by a fishing job. Hole was drilled to 17,212 ft.

Don Brangan has contract for a Fall River wildcat test in Pennington County, South Dakota, for Sam Gary. The 1 Herrington, C NW NW 15-2s-9e, is 20 miles southeast of Rapid City.

Cushman-Pilcher Drilling Co. is contractor for Shumway Uranium Co.'s 1 Government wildcat in Wayne County, Utah. The wildcat is located in NE SE SE 23-27s-4e, 14 miles southwest of South Last Chance.

Globe Drilling Co., Tyler, Tex., is on a 5,800-ft. contract job 4 miles northeast of Slocum, in Anderson County, East Texas. It is a wildcat test for S. C. McKinney, also of Tyler, at 1 Bradford, in the John B. Trainery Survey. Woodbine sand is the objective.

Schimmel Drilling Co., San Antonio, can claim the most southerly drilling job now active in the United States. It is drilling an 8,000-ft. wildcat test near the south tip of Texas. Location is 2½ miles southeast of Brownsville, in little-explored Cameron County. It is a contract operation for Rodney Lelange and O. Neathery, Jr., at 1 English, in the Espiritu Santo Grant.

Graham-Michealis Drilling Co. is contractor for a 5,800-ft. Mississippian wildcat 4 miles east of the town of Mineola, Clark County, Kansas. The 1 R. T. Blair is in C SW SW 15-30-24, 19 miles southeast of Jumbo field.

The company also will drill one for the same operator at 1 Gano in C SE SW 17-31-29, 7 miles northeast of Plains field and 9 miles northwest of Meade, Meade County, Kansas. This 5,700-ft. test will go to the Mississippian.

Beck Oil Co. is drilling one, and **Penrod Drilling Co.** the other of two wildcat tests Kilroy Co. of Texas, Inc., is starting in Beauregard Parish, southwestern Louisiana. Beck's operation is 3 miles north of Bearhead Creek field at Lutcher-Moore, in 31-5s-11w. It is an 8,800-ft. test. Penrod's contract calls for a 9,300-ft. test at 1 Miller,

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in 7-5s-6w, southeast of Dry Creek, in the most northerly southeast corner of the parish.

R. L. Chance Drilling Co., Houston, will be contractor for Union Oil Co. of California's 1 Laurence Sanchez, a Lafourch Parish wildcat in South Louisiana. Location of this 12,400-ft. test is 24-14s-17e, 2 miles south of one-well Kraemer gas field.

Superior Drilling Co. will drill a wildcat for Garnes W. Weaver at 1 W. L. Garth et al, 3 miles southeast of Batson in Hardin County, Texas. The 9,800-ft. Strain field area wildcat, is on the Gregoria Garcia Survey A-22, Lot 2.

Dutton Drilling Co. holds contract for Ada Oil Co. 1 Kinada-Sternenberg, a 7,500-ft. wildcat 8½ miles north of Kountze in Hardin County, Texas. Location is in the H&TC Survey, A-306, Section 191, and 2,400 ft. northeast of the 1 Wm. C. Kin-Solving gas-discovery.

Rowan Drilling Co., Houston, is to drill a deep test for The Texas Co. at a wildcat location southwest of Lake Hatch field, 15 miles southwest of Houma, in Terrebonne Parish, southeastern Louisiana. Location is for 1 Continental Land & Fur, Inc., in 14-18s-15e. Permit is for 13,000 ft.

Crews Drilling Co., Alice, Tex., is under contract for a 6,000-ft. wildcat test 7 miles southwest of Dinero, in southeastern Live Oak County, South Texas. Operator is Skinner Corp., of San Antonio, with Tom Crews, of the contracting company, and Keemac Lease Service, of Corpus Christi, as associates. Location is for 1 McNeill, in Section 187, Hooper & Wade Survey.

Gulf Coast Drilling & Exploration, Inc., Laurel, Miss., has two new contract operations going in southern Mississippi. One is a confirmation test for Skelly Oil Co.'s and Kin-Ark Oil Co.'s deep gas-condensate discovery near Dexter, in southeastern Walthall County. The other is an 11,500-ft. wildcat test for Southern Natural Gas Co. at 1 Board of Supervisors, in 16-1s-16w, 8 miles southwest of Lumberton, in northwestern Pearl River County. The Dexter well, 1 Herring, in 32-2n-13e, is 2,000 ft. northeast of the discovery well, and just across the line in southwestern Marion County. It is a 13,600-ft. test to the Lower Cretaceous-Paluxy sand, the deeper of two zones in which the discovery well was completed last July.

Abney & Sons, Oil City, La., has a new 4,000-ft. Travis Peak operation at Pleasant Grove, 9½ miles southeast of El Dorado, in Union County, southern Arkansas. It is a contract job for Caddo Oil Co., Inc., of Shreveport. Location is for 1 Ward, in 4-19s-14w. It is an exploratory test. Field production is from the shallower Nacatoch sand, nearest being ½ mile north.

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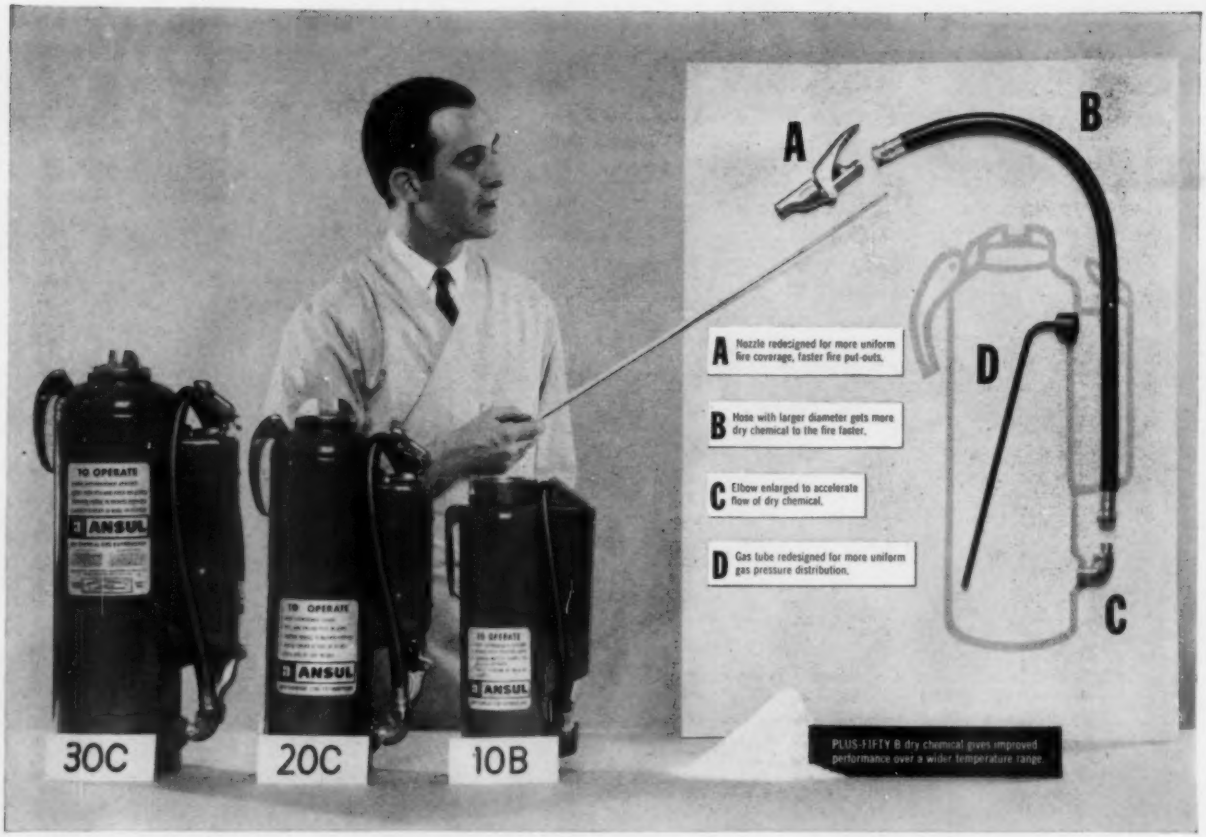
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Pipeline Patrol

... Report on Construction

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way.

U.S. Crude-Oil Pipelines

• **Belle Fourche Pipeline Co.**
Project: 30 miles of 6-in. from Donkey Creek pool to Fiddler Creek pool in northeastern Wyo. Will later build a line from Fiddler Creek to connect with Butte Pipe Line Co. near Osage, Wyo.
Status: Planned.

• **Cape Pipe Line Co.** (Sun Oil Co., Cities Service Co., Atlantic Refining Co.)
Project: Line from lower Delaware Bay to Philadelphia.
Status: Long range plans.
Completion: 1960.

• **Forest Pipeline Corp.**
Project: 35 miles of 8-in. from Grieve field, Wyoming, to Platte Pipe Line at Casper.
Status: Under way.
Completion: Fall 1957.

• **Four Corners Pipe Line Co.** (Shell, Standard of Calif., Continental, Gulf, Richfield, Superior)
Project: 635 miles of 16-in. from Aneth field in southern Utah to Los Angeles, 86 miles of 12-in. from New Mexico's Bisti field to Red Mesa station 35 miles southeast of Bluff, Utah, and 3 miles of 6, 8, 10-in. feeder lines from other fields in New Mexico and Utah. Will be operated by Shell Pipe Line.
Status: Under way.
Contractor: **A. P. Vaughn Construction Co.** and **Potashnick Construction Co.** have 170 miles of 16-in. from Aneth field to Cameron, Ariz., and 100 miles of 16-in. from Seligman to the Colorado Rive. **R. H. Fulton Construction Co.** has 98 miles of 16-in. from Cameron to Seligman, Ariz., and 217 miles of 16-in. from the Colorado River to Olive, Calif. **Pacific Pipeline Co.**, 46 miles of 16-in. from Olive to Los Angeles; **Standard Pipeline Construction Co.**, feeder lines to Utah and New Mexico fields.
Completion: End 1957.

• **Great Northern Railway Co.**
Project: 400 to 600 miles of 12 to 20-in. from Williston basin in Montana and North Dakota, to Clearbrook or St. Paul, Minn.
Status: Planned.
Contractor: **Pipe Line Technologists, Inc.** has completed feasibility study.

• **Interstate Oil Pipe Line Co.**
Project: 5 miles of 4-in. from South Bosco field, and 5 miles of various size from Church Point field, La., to present main line.
Status: Proposed

• **Magnolia Pipe Line Co.**
Project: 24 miles of 20-in., 20 miles of 12-in., 83 miles of 16-in. from Corsicana to Clyde, Tex.
Status: Under way.
Contractor: **H. B. Zachry Co.**
Completion: November 1, 1957.
Project: 120 miles of 16-in., 4 miles of 12-in. from Clyde to Midland, Tex.
Status: Under way.
Contractor: **O. R. Burden Construction Corp.**
Completion: December 31, 1957.

• **Muskegon Pipe Line Corp.** (Aurora Gasoline Co., Service Pipe Line Co.)
Project: 165 miles of 10-in. from Griffith, Ind., to Muskegon, Mich.
Status: Under way.
Contractor: **Midwestern Constructors, Inc.**
Completion: Late 1957.

• **Northwest Pipeline Corp.**
Project 80 miles of 8-in. and 300 miles of 10-in. crude and products line from Four Corners area to Salt Lake City.
Status: Proposed.

• **Offshore Gathering Corp., Houston.**
Project: 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana. (Dual line.)
Status: Proposed.

• **Oil Field Pipe Line, Inc.**
Project: 200 miles 8 and 12-in. line from near Elkhart, to Ellinwood, Kans.
Status: Proposed.

• **Salt Lake Pipe Line Co.**
Project: 93 miles of 10-in. loops from Rangely, Colo., to Salt Lake City.
Status: Under way.
Contractor: **Engineers Limited Pipeline Co.**
Completion: December 1, 1957.

• **Shell Oil Co.**
Project: Undetermined length of 3, 4-in. in South Louisiana.
Status: Under way.
Contractor: **Brown & Root, Inc.**, W. P. Stanley, spread superintendent, office at Buras, La.
Completion: September 30, 1957.

• **Sinclair Pipeline Co.**
Project: 150 miles of 20-in. from Teague, Tex., to Houston.
Status: Planned for 1958.
Completion: 1958.

• **Skelly Oil Co.**
Project: 38 miles of 8-in. extension of its gathering system into southern Kiowa County, Kansas.
Status: To start in September.
Completion: Early fall 1957.
Project: 50 miles of 12-in. to replace partially looped 6, 8-in. line between Cunningham and Burton, Kans.
Status: To start as soon as pipe is received.
Completion: Late 1957.

• **Southern Kansas Pipeline, Inc.**
Project: 200 miles of 6 to 10-in. in Kans. from southwestern Meade County to 10 miles north of Arkansas City.
Status: Proposed. Request filed with Kansas Corporation Commission for permit.

• **Tecumseh Pipe Line System** (Sinclair Pipe Line, Ashland, Pure)
Project: 201 miles of 20-in. between Griffith, Ind., and Cygnet, Ohio.
Status: Under way.
Contractor: **O. R. Burden Construction Corp.** and **Morrison Construction Co.**
Completion: September 1957.

• **Texas-New Mexico Pipe Line Co.** (Sinclair, Texas Co., Tidewater, Empire)
Project: 512 miles of 16-in. from southeast corner of Utah to Jal, N. M.
Status: Pipe laying to start October 15, 1957.
Contractor: **Four Way Co., Inc.**, has 150 miles from Aneth field southeast. **Panama, Inc.**, has remaining 362 miles.
Completion: 1958.

U.S. Products Pipelines

• **Alaska-Yukon Refiners & Distributors, Ltd.**
Project: Two lines: one 150 miles from

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Pipeline Patrol

Haines to Haines Junction, Alaska, linking with government Canol line; another from Tok Junction, on Canol line, to Anchorage.
Status: Proposed.
Completion: 1959.

• **American Pipe Line Co.**
Project: Line from Gulf Coast to New York City. Has ODM approval to amortize 40 per cent of cost with fast writeoff.
Status: Proposed.

• **Buckeye Pipe Line Co.**
Project: Conversion of 32 miles of 8-in. between Mantua and Youngstown, Ohio.
Status: Planned.
Contractor: Company will do own work.
Completion: November 1957.
Project: 70 miles of 8-in. from Wayne to vicinity of Durand, Mich.
Status: Under way.
Completion: Early 1958.

• **Cities Service Pipe Line Co.**
Project: 30 miles of 6-in. ethylene line from Lake Charles, La., to Orange, Tex.
Status: Under way.
Completion: October 1, 1957.
Project: 168 miles of 6-in. L.P.G. line from East Chicago, Ind., to Lowell, Mich.
Status: Under way.
Contractor: **Somerville Construction Co.** has 98 miles from Lowell to South Bend, Ind., Robert Hively, spread superintendent, office at Ada, Mich. **M. L. Hulcher Co., Inc.** has 53 miles from South Bend to East Gary, Ind.
Completion: September 1957.

• **El Paso Natural Gas Co.**
Project: 11 miles of 4-in. L.P.G. from Snyder Line to South Andrews Plant, Tex.
Status: Planned.
Project: 240 miles of 6-in. from Odessa to El. Paso, Tex.
Status: Under way.
Contractor: **McVean & Barlow, Inc.**, E. J. Miller, supt.
Completion: March 1, 1958.

• **Emerald Pipe Line Corp.**
Project: 120 miles of 6-in. from Sunray, Tex., to Tucumcari, N. M.
Status: Plannned.
Completion: December 1, 1957.

• **Everglades Pipe Line Co.**
Project: 60 miles of 10-in. from Port Everglades, Fla., to Miami's International Airport and terminals south.
Status: Under way.

• **Florida Pipeline & Storage Co.**
Project: 67 miles from Everglades, Fla., to Homestead Air Force Base south of Miami.
Status: Under way.
Contractor: **Fish Service Corp.**
Completion: December 1957.

• **Great Lakes Pipe Line Co.**
Project: 93 miles of 8-in. from south of St. Paul to Eau Claire, Wis.; 68 miles of 12-in. from Great Lakes intersecting point with Badger Pipe Line to Chicago.
Status: Under way.
Contractor: **R. H. Fulton & Co.** has the 8-in. **Midwestern Contractors, Inc.**, has 20 miles of 12-in. in Chicago area and **M-R Co.** has 48 miles of 12-in. from Badger system east.
Completion: Late 1957.
Project: 15 miles of 6-in. from Lincoln, Neb., to Lincoln air base.
Project: 140 miles of 8-in. from Minneapolis to Superior terminals.
Status: Under way.
Contractor: **Laco Pipeline Contractors, Inc.**
Project: 34 miles of 12-in. from Tulsa to Barnsdall, Okla., replacing 12, 8-in. lines.
Contractor: **Midwestern Constructors, Inc.**
Completion: Late 1957.

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CHAPTER 5

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Oklahoma City, Oklahoma

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Northern Natural Gas Company
2223 Dodge Street
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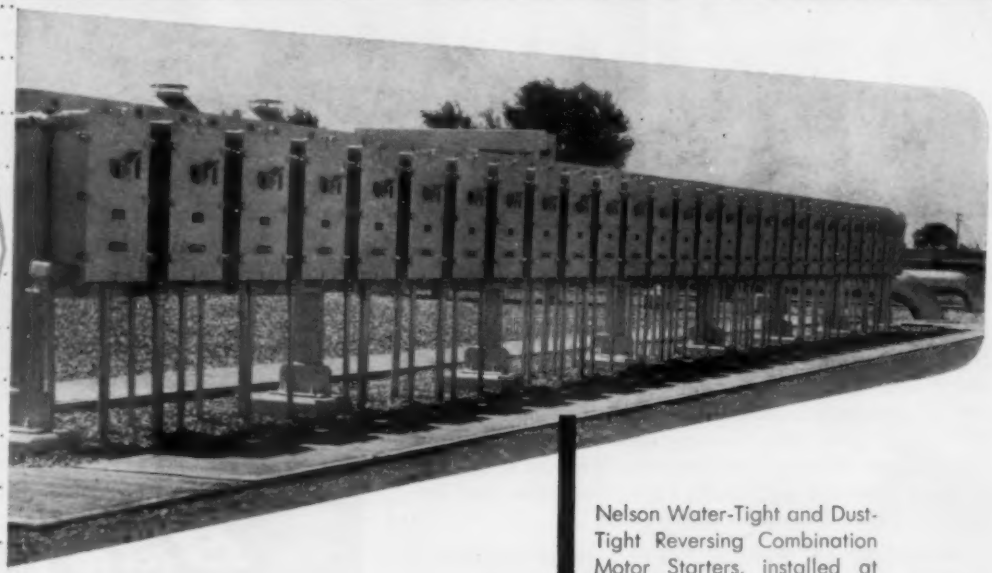

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Pipeline Patrol

Project: 14 miles of 8-in. from Coffeyville to Independence, Kans., replacing 4-in. line.
Contractor: **Jess Whitlow Pipe Line Service.**
Project: 11 miles of 8-in. from 10 miles east of Donahue, Iowa, to terminals at Bettendorf, Iowa.
Contractor: **R. T. Perry Pipe Line Construction.**

- **Laurel Pipeline Co.** (Gulf Refining Co., Sinclair Pipe Line Co., The Texas Co.)

Project: 100 miles of 24-in. and 340 miles of line graduating down to 14-in. at the west terminus, from Philadelphia to Cleveland.
Status: To start early 1958.
Completion: 1958.

- **Leonard Refineries, Inc.**

Project: 43 miles of 6-in. from Alma to Lansing, Mich.
Status: Planned.
Completion: Late fall 1957.

- **Northwest Pipeline Corp.**

Project: 80 miles of 8-in. and 300 miles of 10-in. products and crude line from Four Corners area to Salt Lake City.
Status: Proposed.

- **Ohio Oil Co.**

Project: 350-miles of 12-in. from Wood River, and Robinson, Ill., to Chicago.
Status: Under way.
Contractor: **Panama-Williams Corp.** has 84 miles from Robinson to Champaign.
Completion: 1958.

- **Salt Lake Pipe Line Co.**

Project: 80 miles of 8-in. loops from Adams to Ontario, Ore.
Status: Under way.
Contractor: **Hallmac Construction Co.**

- **Texas Eastern Transmission Corp.**

Project: 231 miles of 14-in. from Seymour, Ind., to Chicago.
Status: Under way.
Contractors: **H. L. Gentry Construction Co.,** has 84 miles starting at Seymour; **Latex Construction Co.** the next 93.1 miles; **Western Pipeline, Inc.,** the next 38.6 miles.
Completion: September 1957.

- **Trust Pipe Line Co.** (Cosden Petroleum)

Project: 138 miles of 6-in. from Hawley, near Abilene, to Wichita Falls, Tex.
Status: Under way.
Contractor: **Holder Construction Co.**
Completion: October 15, 1957.

- **Underground Storage & Exploration, Inc.**

Project: 393 miles of 12-in. L.P.G. line from Moundsville, W. Va., to Newark, N. J., plus 95 miles of 6, 8-in. laterals to Mauch Chunk, Pa., and to Philadelphia.
Status: Proposed.

- **Union Oil Co. of California**

Project: 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry product from its Rifle shale-oil plant.
Status: Proposed.

U.S. Natural-Gas Pipelines

- **Arkansas Louisiana Gas Co.**

Project: A 300-mile line, plus gathering lines, from Tex.-La. coastal area to northern La., to connect with present system.
Status: Long-range plans.

- **Atlantic Seaboard Corp.**

Project: 6 miles of 26-in. from Petersburg to Moorefield, W. Va.
Status: Has temporary FPC approval.
Contractor: **Williams-Austin Contsruction Co.**
Completion: November 1957.

- **Carolina Pipeline Co.**

Project: 177 miles of 2, 3, 4, 6, 8, and 10-in. between Blacksburg and Camden, S. C.
Status: Under way.
Contractor: **Panama-Williams Corp.** has construction contract. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.

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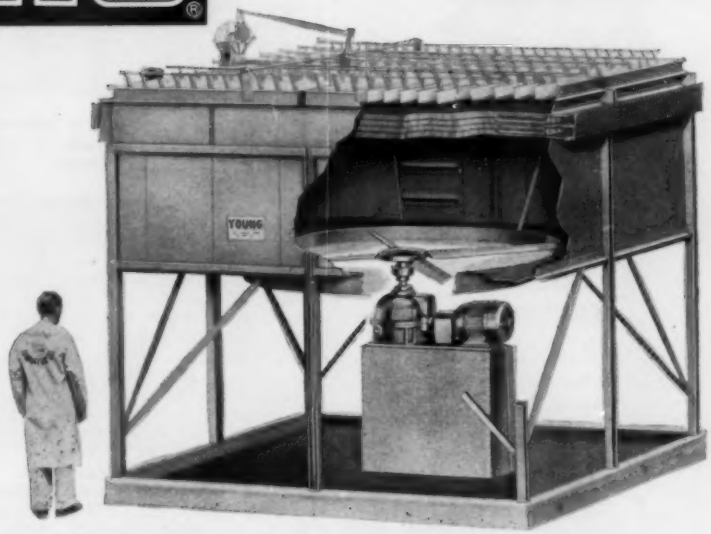

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4 • **TUBE-FIN ASSEMBLY.** The positive mechanical bond of fin to tube ensures maximum performance, unaffected by hot and cold cycles.

5 • **HORSEPOWER REQUIREMENTS** are lower because of decreased air flow resistance.

6 • **BAFFLE PLATE ARRANGEMENT** allows for more liquid passes—higher tube velocity—consequently takes better advantage of cooling surface.

7 • **FRAME.** Uprights and braces from heavy gauge channel steel; cover plates of heavy gauge sheet steel.

8 • **BRACING.** Plenum chamber is braced at intervals for structural rigidity, and to dampen vibration which may be caused by air turbulence.

9 • **TUBE REPLACEMENT,** where operating conditions necessitate, on both Monofin and Monobloc construction is easily accomplished.

10 • **ASME** code specifications can be furnished on cores where required.

11 • **FINS.** Straight in-line design reduces air resistance, provides for greater cleanliness.

12 • **PLENUM CHAMBER** designed to take full advantage of all heat transfer surfaces, equalizes distribution of air.

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Pipeline Patrol

• **Central Hudson Gas & Electric Corp.**
Project: 46 miles of 10-in. from Albany to Kingston, N. Y.
Status: Under way.
Contractor: **Williams-Austin Construction Corp.**, O. L. Martin and Ralph Gaddy, supts., office at Catskill, N. Y.
Completion: December 1, 1957.

• **Cities Service Gas Co.**
Project: 8 miles of 16-in., 20 miles of 8-in., 20 miles of 6-in., and 20 miles of 4-in. field lines in Barber County, Kansas.
Status: Under way.
Contractor: **Vaughn & Taylor Construction Co.**
Project: 3 miles of 12-in., 8 miles of 10-in., 4 miles of 8-in., 8 miles of 6-in., and 37 miles of 4-in. field lines in Eureka Field, Okla.
Status: Under way.
Contractor: **Prairie Construction Co.**
Project. 64 miles of 6 to 30-in. in Leavenworth and Anderson counties, Kans., Cass County, Mo., and Oklahoma County, Okla.
Status: Planned.
Project: 75 miles of 30-in. from Independence to near Welda, Kan.
Status: Pending FPC approval.

• **Coastal States Gas Producing Co.**
Project: A 20-mile gathering system from the Rock Island area of Colorado County, Tex., to the United Gas Corp. system.

• **Coastal States Gas Producing Co.** and **Southern Coast Corp.**
Project: 45 miles of 2 to 10-in. in Bee County, Tex. to connect presently shutin fields with Texas Eastern Transmission Corp.'s system.
Status: Planned.

• **Coastal Transmission Corp.**
Project: 575 miles of 12, 20, 22, 24-in. main line and 414 miles of 2 to 14-in. gathering lines between McAllen, Tex., and Baton Rouge, La.
Status: Under way.
Completion: January 1, 1958.

• **Colonial Natural Gas Corp.**
Project: Two systems; one between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.
Status: Proposed.

• **Colorado Interstate Gas Co.**
Project: 1957 program . . . 66 miles of 10-in., 40 miles of 34-in., 109 miles of 26-in., and 100 miles of 24-in. from Springfield, Colo., to Pueblo, Colo; 345 miles of 30-in. from Kit Carson, Colo., to Beatrice, Neb.; 50 miles of 22-in. from Laverne to Hooker, Okla.; 24 miles of 22-in. Panhandle field looping
Status: Pending FPC approval. Has temporary approval for the 50 miles in Okla.

• **Eastern Shore Natural Gas Co.**
Project: 34 miles of 8-in. and 90 miles of 6-in. from connection with Transcontinental Gas Pipe Line Corp. in Maryland, across entire length of Delaware to Salisbury.
Status: Pending FPC approval.

• **East Ohio Gas Co.**
Project: 90 miles of 24-in., and 23 miles of 30-in. from Richfield to Summerfield, Ohio.
Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, James Adams, spread superintendent, office at Wadsworth, Ohio. **Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.
Completion: November 1957.

• **Edison Securities Co.**
Project: 130 miles of 30-in. from San Joaquin Valley fields to Wilmington, Calif.
Status: Being contested by Southern California Gas Co., Southern Counties Gas Co., and Pacific Lighting Gas Supply Co.
Contractor: **Bechtel Corp.**

• **El Paso Natural Gas Co.**
Project: 27 miles of 34-in. San Juan main line loops.
Status: Under way.
Completion: September 1957.
Project: 81 miles of 18-in. and 13 miles of 20-in. from Panoma Plant, Gray County, to Dumas Plant, Moore County, Texas.
Status: Under way.
Contractor: **R. H. Fulton & Co. Coates Field Service, Inc.** has right-of-way acquisition and claims settlement contract.
Completion: November 1, 1957.
Project: 177 miles of 20-in. from Sonora Plant, Sutton County, to Plains Plant, Yoakum County, Texas.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 74 miles of 30-in. Permian-San Juan main line loops.
Status: Planned. Filed for FPC permit.
Completion: January 1958.
Project: 216 miles of 6 to 34-in. and 533 miles of various size in Ariz., Tex., N. M.
Status: Filed for FPC permit.
Project: 47 miles of 30-in. from proposed Lindrith, N. M., plant to proposed Chaco, N. M., plant.
Status: Under way.
Contractor: **Foutz & Bursum Construction Co.**
Completion: 1957.
Project: 38 miles of various size line to make additional gas available at the McElroy-Wilshire plant near Crane, Tex.
Project: 500 miles of 34-in. from Twin

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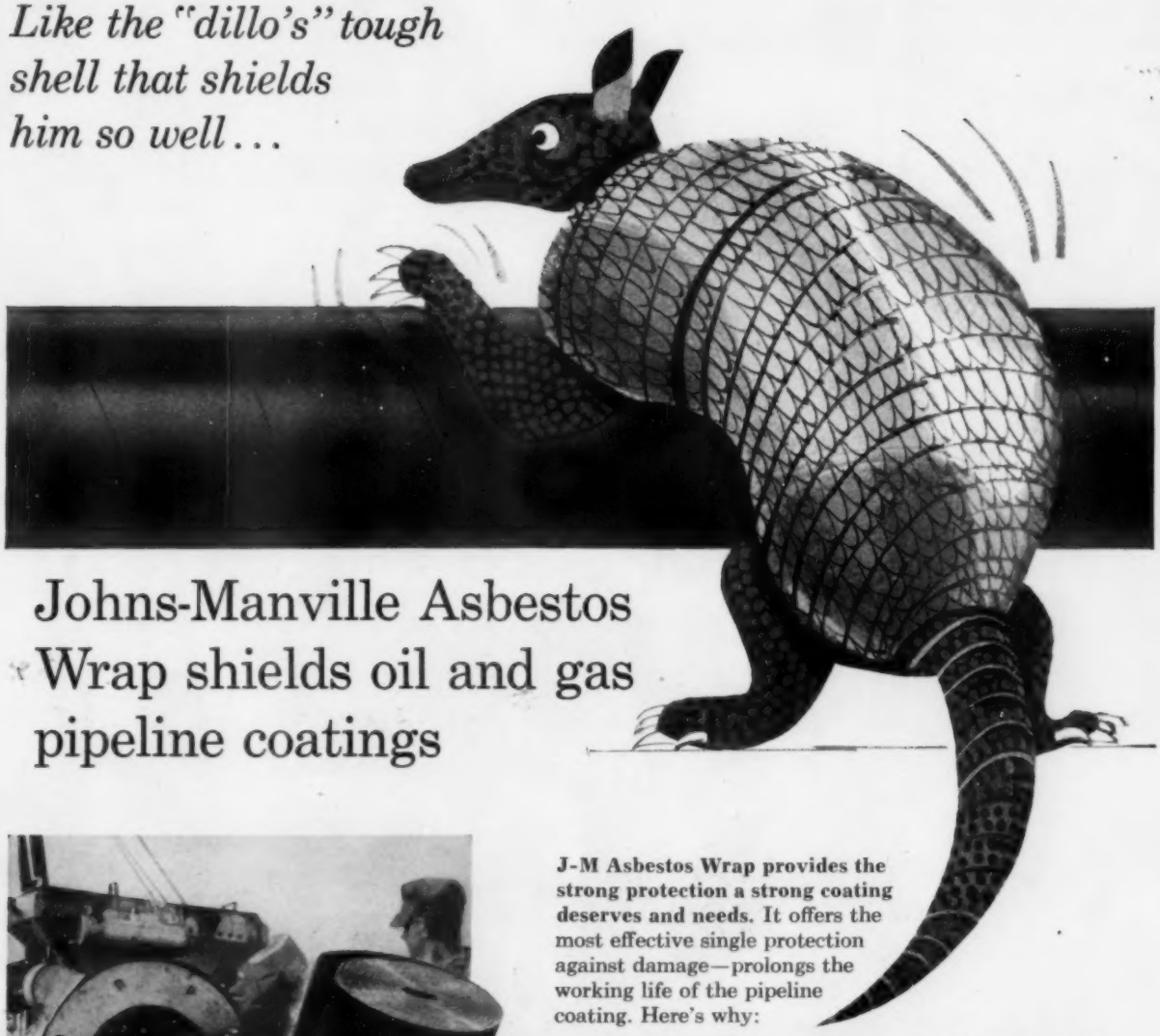
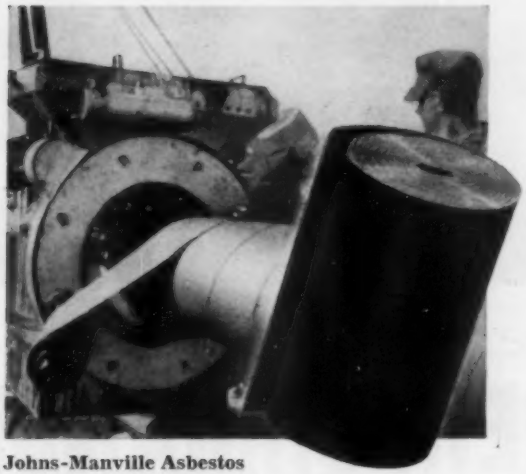


Johns-Manville Asbestos Wrap shields oil and gas pipeline coatings



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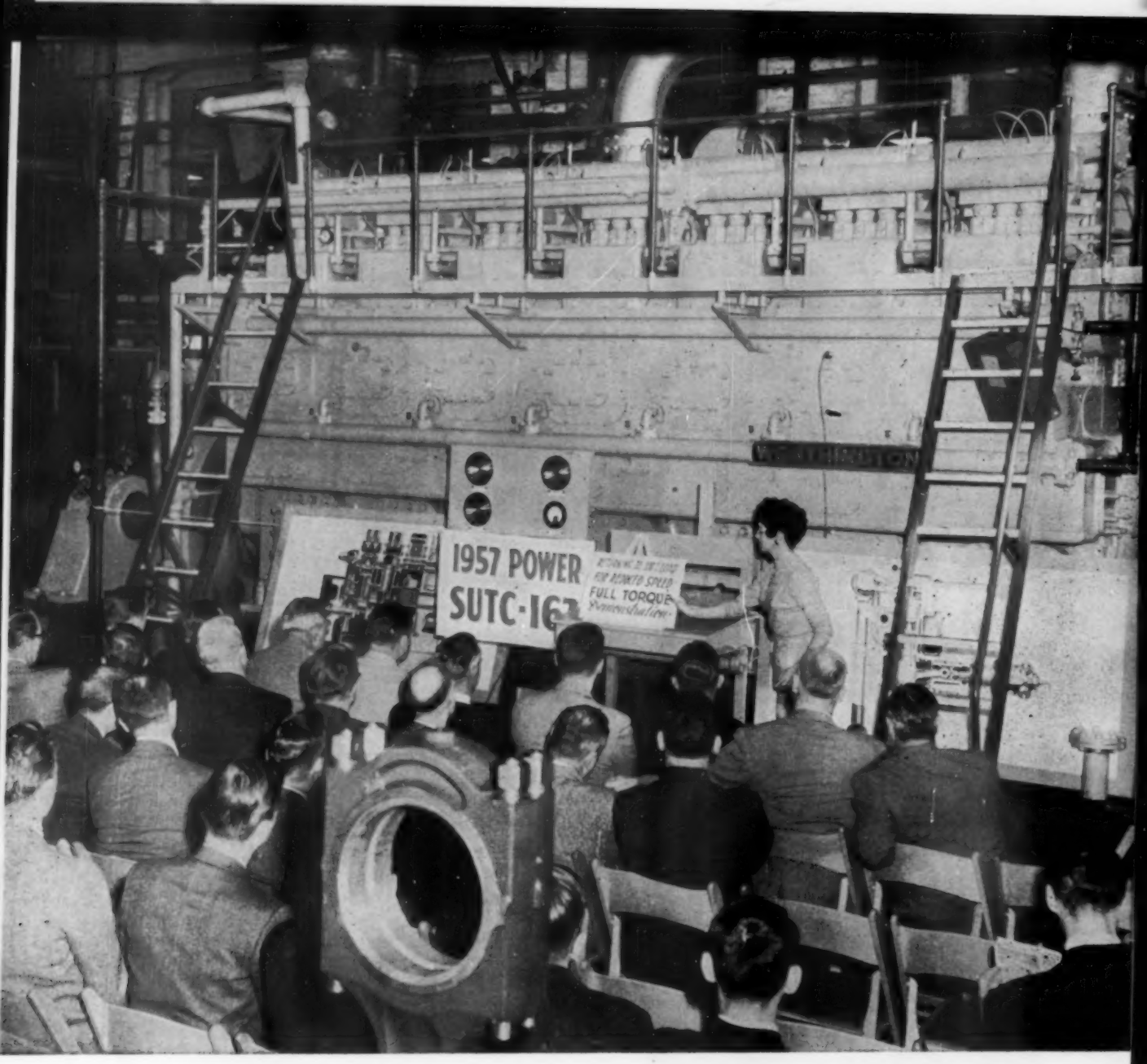

At 1957 Power Fair, engineers witness proof of...

TURBO-UNIFLO PERFORMANCE

There's no better way to judge the performance of an engine than to see it in operation. That's why more than 250 process and pipeline engineers recently gathered in Buffalo, N. Y, to attend Worthington's 1957 "Power Fair."

Star of the show was the new SUTC TURBO-UNIFLO gas engine compressor. The only two-cycle engine compressor with exhaust powered turbocharging from start-up through full-load, the TURBO-UNIFLO features remarkable stability over the complete range of speed and load requirements.

The audience was impressed by the TURBO-UNIFLO's smooth start and quiet operation (as much as 20 decibels quieter than engines with mechanically driven scavenging systems). Next came the overload demonstration to prove the very conservative engine rating.

To show stability, engine speed was gradually reduced while maintaining full torque. 320 rpm . . . 270 rpm . . . 230 rpm (at this point someone offered to bet that it couldn't go below 150). But down it went . . . all the way to 105 rpm before reaching its stalling point.

But this is only half the story. Your Worthington representative will be glad to give you all the facts about the new SUTC TURBO-UNIFLO engine. Get in touch with your nearest Worthington district office or write to Section E-73, Worthington Corporation, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Brantford, Ont. E-73

WORTHINGTON

Pipeline Patrol

Falls, Idaho to California border near Las Vegas, Nev.

Status: Planned.

Completion: September 1959.

Project: 131 miles of 4, 6, 8, 10, 12, 16, 18 and 20-in. gathering lines in Gray, Wheeler, and Collingsworth counties, Texas Panhandle.

Status: Under way.

Contractor: **R. H. Fulton & Co.**

Completion: 1957.

• **Houston Texas Gas & Oil Corp.**

Project: 702 miles of 24-in. from Baton Rouge, La., to Kissimmee, Fla.; 139 miles of 18-in. and 101 miles of 20-in. from Kissimmee to Cutler, Fla.; 642 miles of 3 to 18-in. sales laterals in Florida. Main line to join Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

Status: To start November 1.

Contractor: **Midwestern Constructors** has the 702 miles of 24-in.; **Harbert Construction Corp.** has remainder.

Completion: June 1958.

• **Iron Ranges Natural Gas Co.,** St. Paul

Project: 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minn.

Status: Application pending with FPC.

• **Kansas-Nebraska Natural Gas Co.**

Project: 61 miles of various size gathering line in Camerick field, Texas County, Okla.

Status: Approved.

• **Michigan Consolidated Gas Co.**

Project: 67 miles of 10 and 12-in. between Sears and Travers City, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.** Floyd Huduall, supt., office at Cadillac.

Project: 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich.

Status: Under way.

Contractor: **Somerville Construction Co.** jointly with **H. L. Gentry Construction,** Frank Morris, superintendent, office at Hart, Mich.

• **Midwestern Gas Transmission Co.**

Project: Will build main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in., plus 648 miles of 3 to 18-in. extensions in Minn. and Wis.

Status: Application pending with FPC.

• **Mississippi River Fuel Corp.**

Project: 54 miles of 26-in. loops between Perryville, La., and Columbia, Ill.

Status: Under way.

Contractor: **Cape Construction Co., Inc.**

Completion: November 15, 1957.

• **Montana-Dakota Utilities Co.**

Project: 28 miles of 12-in. from Fallon County to Dawson County, Montana.

Status: Approved.

Project: 6 miles of 12-in. between Mandan and Bismarck, N. D.

Status: Has temporary approval.

• **Mountain Fuel Supply Co.,** Salt Lake City

Project: 38 miles of 20-in. to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

Status: Under way.

Completion: September 1957.

Project: Extension of 12-in. line from Ogden to Logan and Brigham City, Utah.

Status: Has applied to Utah Public Service Commission.

Completion: Late 1957.

• **Natural Gas Pipeline Co. of America**

Project: 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Pritchett, Tex., plus a gathering system.

Status: Under way.

Contractor: **R. H. Fulton & Co.** has Red River crossing in northern Montague County. **Fulton & Brodie, Inc.,** has gathering system. **Eastern Pipeline Contractors** has 80

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Trane furnishes Texas Eastern

Trane equipment now operating at Opelousas, Louisiana compressor station

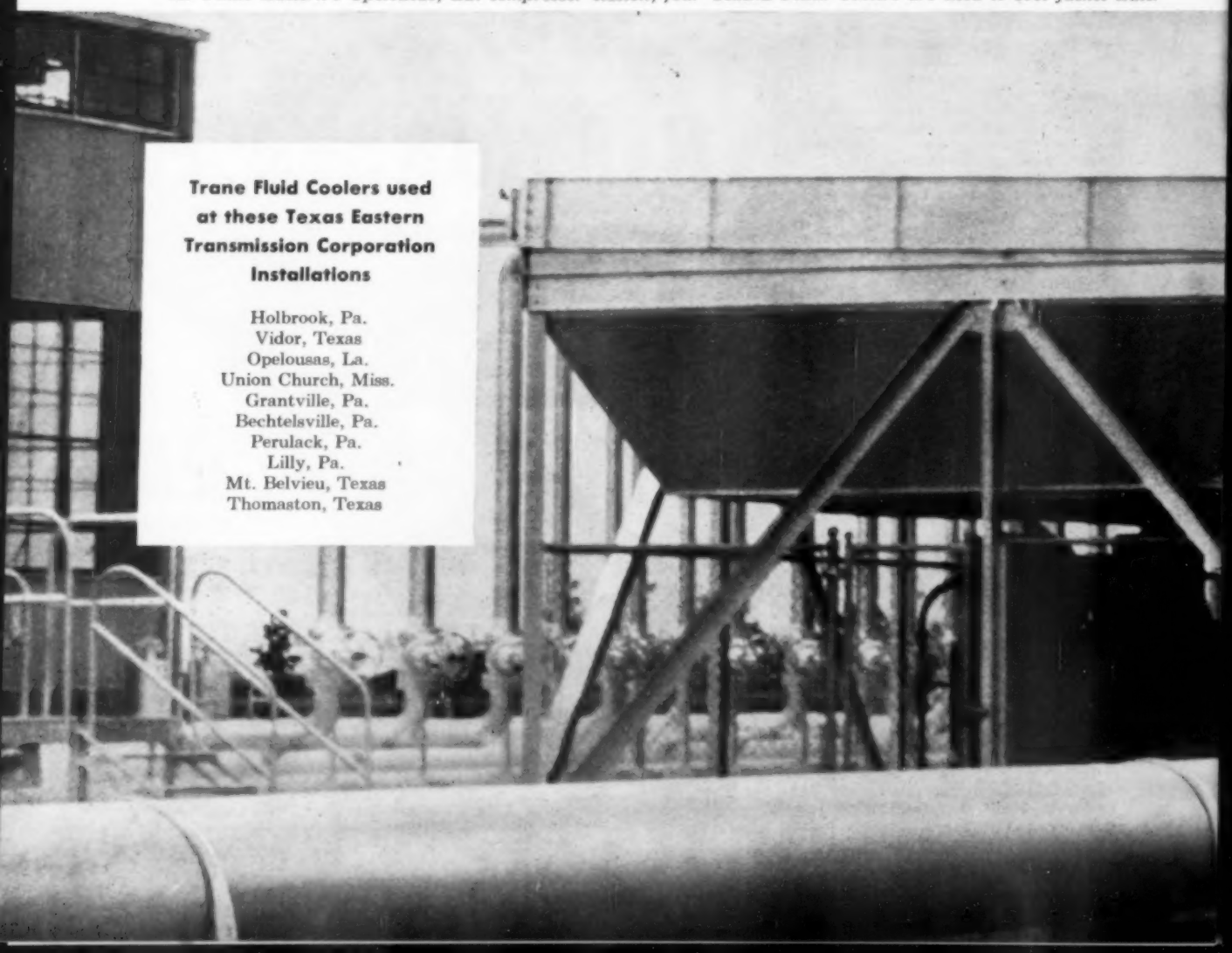
When Texas Eastern Transmission Corporation planned expansion of its Opelousas, Louisiana compressor station from 4 to 6 cells, they used TRANE again for the fluid cooling equipment. It was the *thirteenth* time that Texas Eastern had used TRANE Fluid Coolers.

More and more major pipeline transmission companies are turning to TRANE—*again and again*—for fluid cooling equipment. Many of these users have reported that TRANE Fluid Coolers are rugged, dependable and simply designed—with a minimum of maintenance and adjustment problems.

Unlike many manufacturers, TRANE makes all its own coils—has had thirty years of experience in this highly specialized field. And there are 90 field offices where trained personnel take a responsible interest in every application of TRANE equipment. That's why *you* can turn to TRANE when you have a fluid cooling problem—knowing that TRANE can meet your individual requirements, *and deliver!*

Want more facts? Call your nearby TRANE Sales Office—or write TRANE, La Crosse, Wisconsin.

At Texas Eastern's Opelousas, La. compressor station, four TRANE *Fluid Coolers are used to cool jacket water*



Trane Fluid Coolers used at these Texas Eastern Transmission Corporation Installations

Holbrook, Pa.
Vidor, Texas
Opelousas, La.
Union Church, Miss.
Grantville, Pa.
Bechtelsville, Pa.
Perulack, Pa.
Lilly, Pa.
Mt. Belvieu, Texas
Thomaston, Texas

Fluid Coolers to for the 13th time !

Four 14-foot fans deliver a total of 920,000 cfm. Fan, motor and gearbox are factory aligned on a single metal base. All framework parts are pre-drilled and match-marked for easy installation. Removable header cover plates simplify cleaning and inspection.

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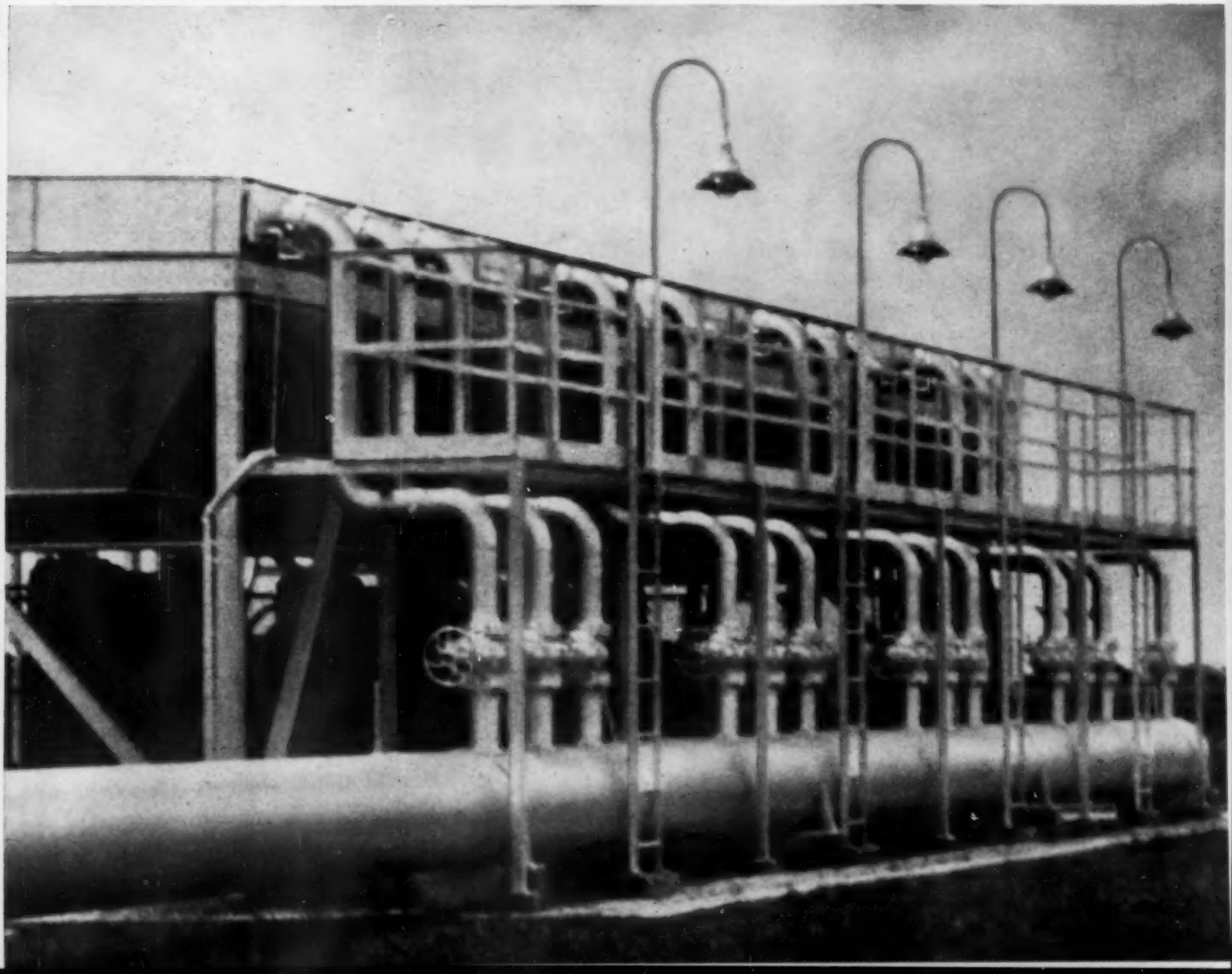

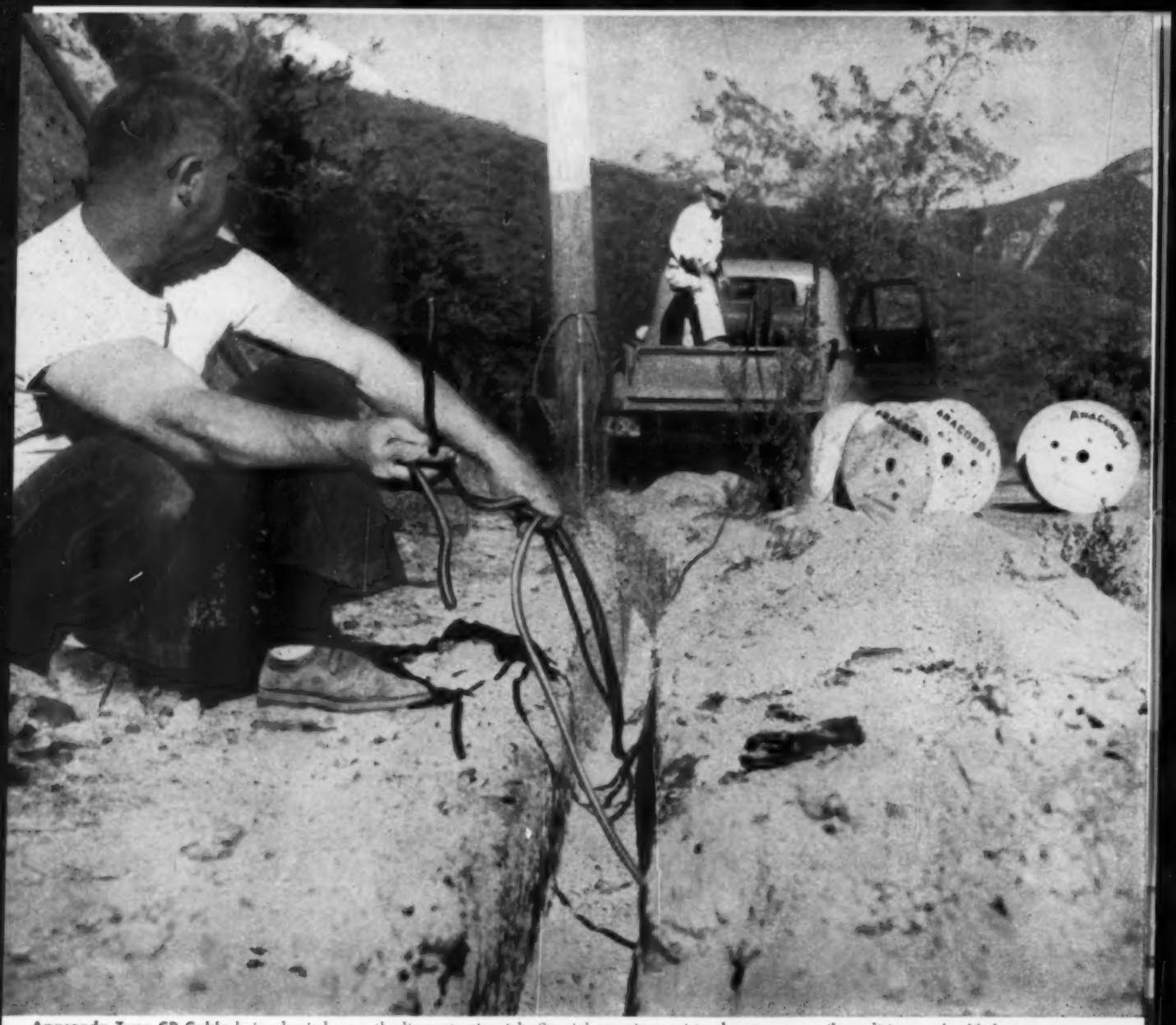

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ABOUT **TYPE CP CABLE**

Pipeline Patrol

miles of 20-in. from Bridgeport, Tex., to Healdton, Okla. **River Construction Corp.** has 173 miles from Mountain View, Okla., to Fritch, Tex. **H. B. Zachry Co.** has 87 miles of 26-in. between Healdton and Mountain View, Okla.

Completion: January 1, 1958.

Project: 389 miles of 36-in. loops along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co., and 91 miles of 30-in. loops along parts of its main line.

Status: Application pending with FPC.

Project: 337 miles of 30-in. between Fritch, Tex., and Beatrice, Neb., and 59 miles of 36-in. between Beatrice and Joliet, Ill., along existing system.

Status: Pending FPC approval.

Completion: 1959.

• **New York State Natural Gas Corp.**

Project: 31 miles of 20-in. from Harrison to Woodhull, N. Y.; 10 miles of 12-in. from Stockbridge to Oneida, N. Y.

Status: Under way.

Contractor: **Harford Brothers,** has the 12-in., A. M. Harford and Robert Mann, superintendents. **Pavilion Pipe Line Corp.** has the 20-in.

Completion: October 15, 1957.

• **Niagara Mohawk Power Corp.**

Project: 14 miles of 18-in. from Phoenix to Palermo, N. Y.

Status: Under way.

Completion: October 1, 1957.

Project: 196 miles of 2 to 16-in. transmission and distribution mains to service areas in central, eastern and northern New York.

Status: Planned.

Contractor: Various.

Completion: December 31, 1957.

• **North Carolina Natural Gas Corp.**

Project: 630 miles of 2 to 16-in. from near Mooresville, eastwardly across N. C.

Status: To start fall 1957.

Completion: Spring 1958.

• **Northern Natural Gas Co.**

Project: 73 miles of 20-in. from Savanna mass to serve 20 new communities on Aberdeen, S. D., line.

Status: Under way.

Contractor: **Troth Construction Co.**

Project: 73 miles of 20-in. from Savanna Creek to Pincher Creek fields in Alberta, Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

Status: Proposed.

Project: 365 miles of main line and 1,090 miles of branch lines to serve communities in Minn., Iowa, S. D., Nebr., Wis.

Status: Filed with FPC March 18, 1957.

Project: 85 miles of 24 and 30-in. loops between Sunray, Tex., and Sioux City, Iowa.

Status: To start September 1957.

Contractor: **R. H. Fulton & Co.**

Completion: December 1957.

Project: 13 miles of 16-in. to replace existing 10-in. line in Hansford County, Texas.

Status: Has temporary FPC authority.

• **Northern Utilities Co.**

Project: 35 miles of 16-in. in Fremont-Natrona County, Wyo., area; 8 miles of 12-in. around Casper; 6 miles of 8-in. from Sand Draw gas field to Beaver Creek field; 12 miles of 6-in. from Beaver Creek field to the system servicing the Riverton-Lander area.

Status: Planned.

• **Offshore Gathering Corp.,** Houston.

Project: 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in., 70 miles of 26-in., 234 miles of 30-in. (Dual line.)

Status: Application pending with FPC.

• **Ohio Fuel Gas Co.**

Project: 11 miles of 18-in. and 11 miles of 20-in. from Gibsonburg, Ohio to Toledo;

Torch control

Pat. No. 2408517

Patent Applied For

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Pipeline Patrol

and 30 miles of 24-in. looping from Pavonia to Attica, Ohio.

Status: Under way.

Contractor: **H. L. Gentry Construction Co.** has the 18 and 20-in.

Completion: Gentry work to be completed September 20; remainder November 25, 1957.

Project: 152 miles of line in Ohio: 43 miles of 24-in. from Crawford Station to Utica; 18 miles of 24-in. from Pavonia Station to Line D; 6 miles of 20-in. from Mount Gilead to Claridon; 4 miles of 20-in. near Dayton; 4 miles of 20-in. near South Charleston; 7 miles of 16-in. near Springfield; 6 miles of 20-in. nnear Oberlin; 17 miles of 20-in. from Oak Hill to Symmes Station; 7 miles of 12-in. from Mount Sterling to Bloomingburg; 2 miles of 8-in. near Bellefontaine; 3 miles of 12-in. near Mansfield; 4 miles of 12-in. near Lakeville; 7 miles of 8-in. in Guernsey and Belmont counties.

Status: Under way.

Contractor: **O. R. Burden Construction Corp.** has completed 43 miles of 24-in. from Sugar Grove near Crawford station, to Utica, Ohio, and 27 miles of 20-in. south from Wellston.

• **Pacific Gas & Electric Co.**

Project: 138 miles of 34-in. looping of the Topock-Milpitas line.

Status: Under way.

Contractor: **Engineers Limited Pipeline Co.**

Completion: December 1, 1957.

Project: 5 miles of 16-in., 160 miles of 12-in., 8 miles of 6-in. from Corning to Eureka, Calif.

Status: Planned.

Contractor: **Engineers Limited Pipeline Co.** and **Alex Robertson Co.**

Completion: January 1, 1958.

Project: 13 miles of 12-in., 2 miles of 10-in. from Santa Cruz to Davenport, Calif.

Status: Planned.

Completion: October 1957.

Project: 1,300 miles of 36-in. from Alberta to San Francisco.

Status: Proposed.

Completion: 1960.

• **Pacific Northwest Pipeline Corp.**

Project: 35 miles of 6, 4-in. lateral from Rainier to Olympia, Wash.

Status: Under way.

Contractor: **Midwestern Construction Co.**

Completion: October 1, 1957.

Project: 36 miles of 6-in. lateral from Coeur d'Alene to Kellogg, Idaho.

Status: Under way.

Contractor: **Hallmac Construction Co.**

Completion: October 1, 1957.

• **Pennsylvania Gas Co.**

Project: 23 miles of 10-in. in Erie County, Pa., 15 miles of 8-in. in Warren and Chautauqua counties, Pa., 30 miles of branch lines, several small distribution lines.

Status: Has FPC permit.

• **Peoples Natural Gas Co.**

Project: 4 miles of 10-in. between Altoona and Tyrone, Pa., to replace 6, 8, and 10-in.

Status: Planned.

Completion: October 18, 1957.

Project: 3 miles of 20-in. near Cresson, Pa., to replace 14-in.

Status: Under way.

Contractor: **Pipe Line Maintenance & Construction Co.**

Completion: September 20, 1957.

Project: 10 miles of 10-in. gathering line near Johnstown, Pa.

Status: Under way.

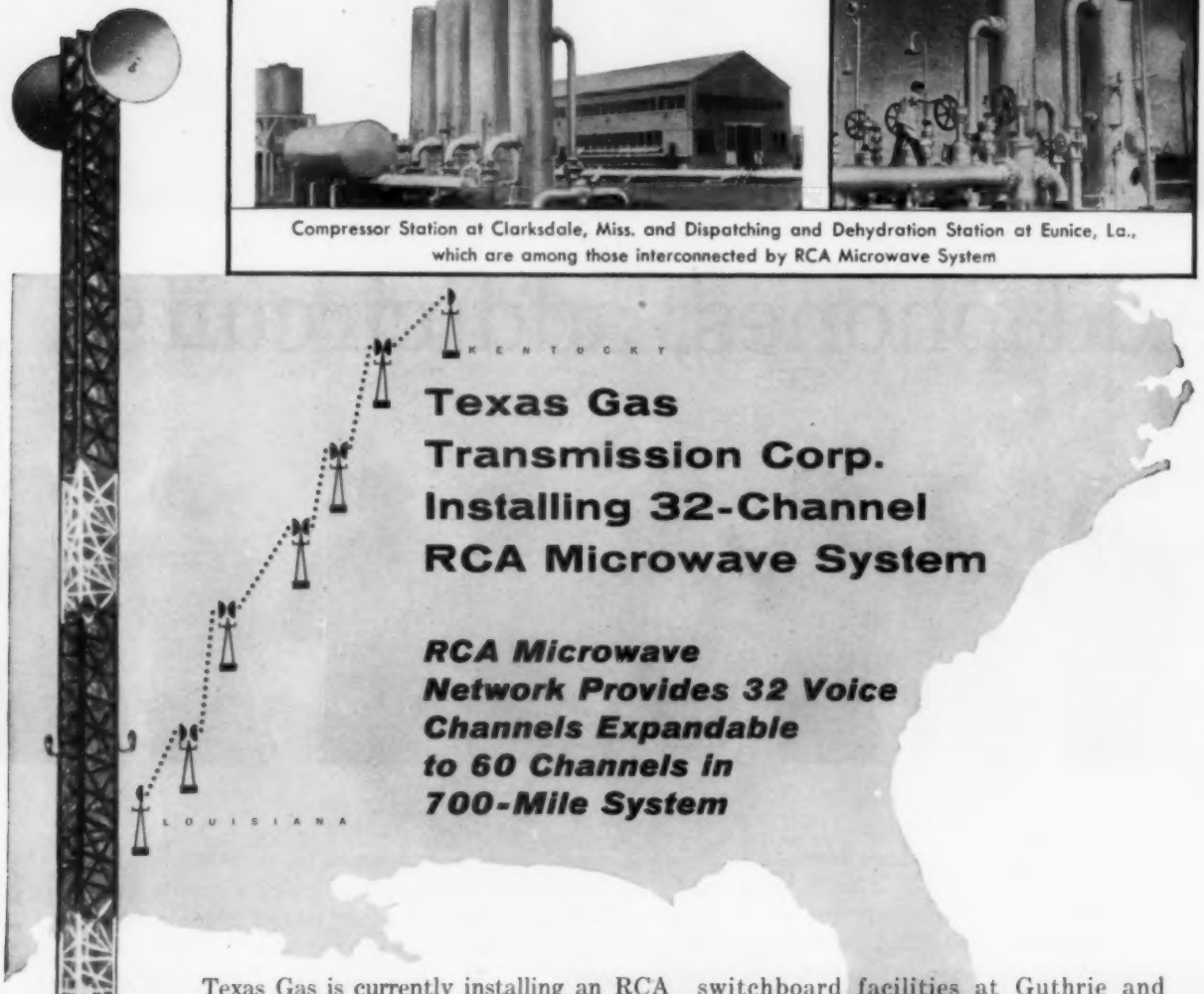
Contractor: **J. Fahey & Sons.**

Completion: September 30, 1957.

• **Permian Basin Pipeline Co.**

Project: 83 miles of 16-in. from its Spraberry station in Midland County, Tex., to tie in with Pioneer Gathering System, Inc. in

Compressor Station at Clarksdale, Miss. and Dispatching and Dehydration Station at Eunice, La., which are among those interconnected by RCA Microwave System



Texas Gas Transmission Corp. Installing 32-Channel RCA Microwave System

RCA Microwave Network Provides 32 Voice Channels Expandable to 60 Channels in 700-Mile System

Texas Gas is currently installing an RCA CW-20A Microwave communication system. The initial 32 channels will include dispatching and operational party lines, private lines to each compressor station, and a mobile radio control circuit to connect 118 mobile radio units.

Twenty-three compressor stations, plus field offices in Kentucky, Tennessee, Mississippi, Arkansas and Louisiana, will be provided with dependable integrated communications facilities.

The new microwave network will tie switchboard facilities at Guthrie and Owensboro to all other system points and provide instantaneous service between any two locations. Installation is on a turnkey basis by RCA which is also training Texas Gas personnel in operation and maintenance.

Further particulars on the use of dependable RCA Microwave in utilities, pipelines, offshore drilling, turnpike and other applications will be mailed on request. RCA Microwave specialists are experience-qualified to answer your questions and help plan your installation.

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LENKURT CARRIER equipment—engineered, furnished and installed by Automatic Electric—can add new circuits on existing wires for remote control and telemetering, as well as expanding telephone communications.

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SOUTH LA.

Pipeline Patrol

northwestern Schleicher County, Tex.
Status: Under way.
Contractor: **Lone Star Constructors,** H. A. (Red) Wylie, supt.
Completion: November 1957.

- **Phillips Petroleum Co.**
  Project: 3 miles of 24-in. in Moore County Texas.
  Status: Planned.
  Completion: October 1, 1957.
  Project: 30 miles of 3 to 8-in. in Moore Hutchinson, Sherman, Hansford, and Gra counties, Tex., and in Texas County, Okla.
  Status: Planned.
  Contractor: Various.
  Completion: January 1, 1958.
- **Piedmont Gas Co.**
  Project: 78 miles of 2 to 8-in. extension off Trancontinental in North Carolina to serve Gaston, Lincoln, Catawba, Caldwell and Burke counties.
  Status: Has FPC approval.
- **Pioneer Gathering System, Inc.**
  Project: 70 miles of mostly 16, 12-in. in Val Verde, Schleicher, Sutton counties, Tex.
  Status: Under way.
  Contractor: **R. H. Fulton & Co.**
  Competion: Early fall 1957.
- **Shamrock Pipe Line Corp.**
  Project: 2 miles of 12-in., 9 miles of 10-in., 10 miles of 8-in., 5 miles of 6-in., 3 miles of 4-in. in Dallas and Sherman counties, Tex.
  Status: Planned.
  Completion: October 1, 1957.
- **Signal Oil & Gas Co.**
  Project: 80 miles of gathering lines to Tioga, N. D., gasoline plant from South Blue Buttes, Antelope, and North Blue Buttes, McKenzie County, N. D.
  Status: Under way.
  Contractor: **C. P. Bartley & Son.**
  Completion: October 1, 1957.
- **Southern Natural Gas Co.**
  Project: 10 miles of 8-in. laterals in Napoleonville Field and Fort Jackson Field, La.
  Status: Has FPC approval.
  Completion: December 1, 1957.
  Project: 32 miles of 6-in. from Chandeleu Sound area, Breton Island, La.; 7 miles of 8-in. and 5 miles of 10-in. from Main Pass area to Olga, La.; 9 miles of 8-in. from Bastian Bay Field to Fort Jackson Field 7 miles of 8-in. laterals in Manila Village Field.
  Status: Has FPC approval.
  Completion: December 1, 1957.
  Project: 14 miles of 24 and 26-in., 62 miles of 20-in., 48 miles of 16-in., 21 miles of 12-in., 14 miles of 10-in., and 51 miles of smaller lines in La.
  Status: Pending FPC approval.
- **Spokane Natural Gas Co.**
  Project: 400 miles of 1 through 24-in. distribution system at Spokane.
  Status: Under way.
  Contractor: **Hallmac Construction Co.**; W. L. Williams, supt., office at Spokane.
  Completion: 1957
- **Tennessee Gas Transmission Co.**
  Project: 34 miles of 30-in. loop from near Lancaster to near Winchester, Ky.
  Status: Under way.
  Contractor: **Oklahoma Pipeline Constructors,** Gene Gohring, supt., office at Richmond.
  Project: 10 miles of 24-in. loop near New Castle, Pa.
  Status: Under way.
  Contractor: **Harford Brothers Pipeline Contractors.**
  Project: Triple 24-in. underwater crossing of Mississippi River near Greenville, Miss.
  Status: Under way.
  Contractor: **Pentzien, Inc.**, and **Collins Construction Co.**
  Project: 71 miles of 26-in., 10 miles of 20-

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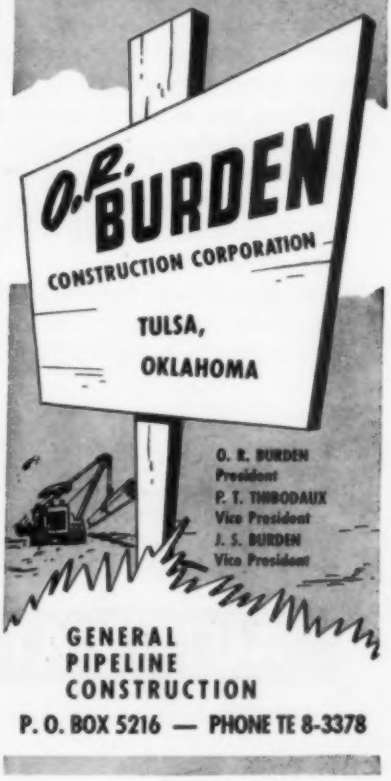

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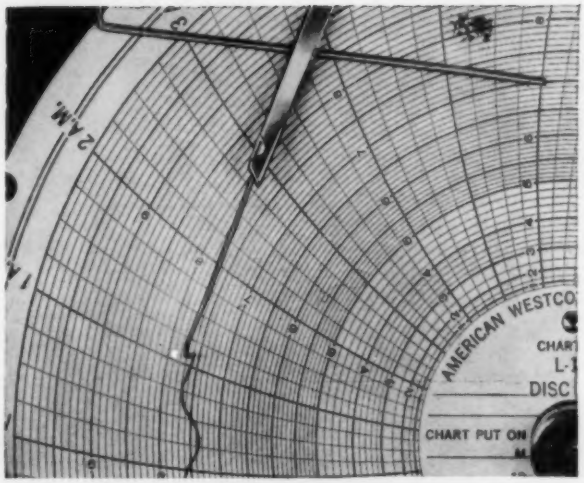

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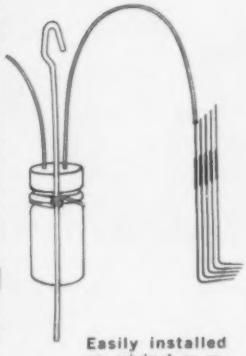

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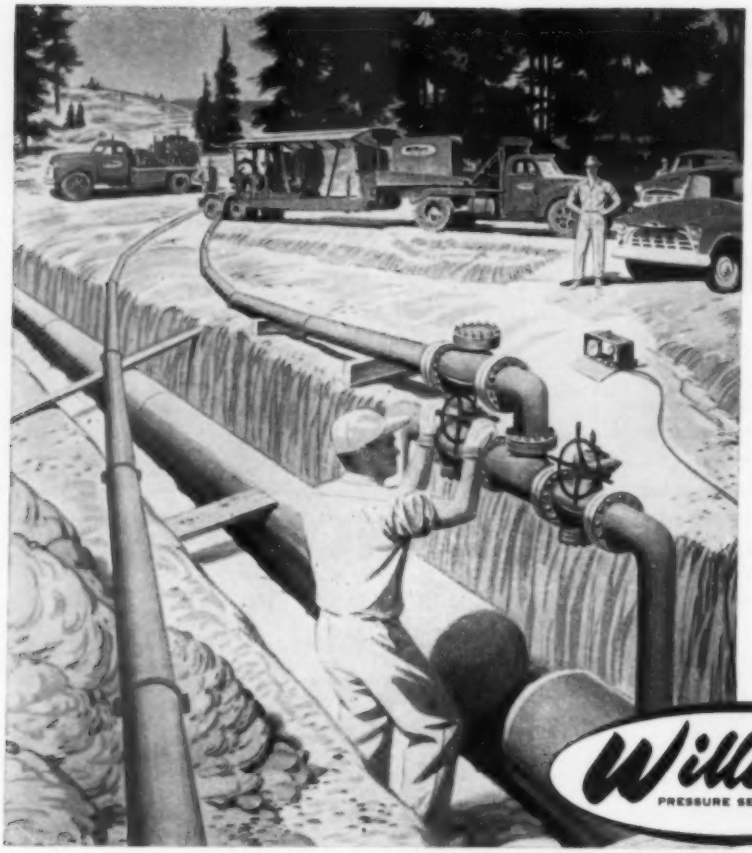

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Pipeline Patrol

in., 16 miles of 16-in., and 10 miles of 12-in. gathering lines from near Kinder, La., southward to offshore fields in Gulf of Mexico.

Status: Under way.

Contractor: **Brown & Root, Inc.**

Completion: Fall 1957.

Project: 556 miles of 30-in. from Mississippi Delta area south of New Orleans to Portland, Tenn.

Status: Pending FPC approval.

Project: 76 miles of 24-in. from Coudersport, Pa., to Hamburg, N. Y.

Status: Pending FPC approval.

Project: 163 miles of 30-in. and 101 miles of 26-in. from Portland, Tenn., to near Lancaster, Ky.; from Winchester, Ky., to Morehead, Ky.; from Catlettsburg, Ky., toward Broad Run, W. Va.; from New Wilmington, Pa., to Mercer, Pa.; and from Morehead, Ky., to Catlettsburg, Ky.

Status: Pending FPC approval.

• **Texas Gas Transmission Corp.**

Project: 20 miles of 18-in. near Bastrop, La.

Status: Under way.

Contractor: **Houston Contracting Co.**, W. H. Hayes, supt., office at Bastrop.

Completion: Fall 1957.

• **Texas Eastern Transmission Corp.**

Project: 17 miles of 8-in. and 3 miles of 6-in. from its 20-in. Baytown-Hankamer line to Alco-Mag field in Harris County, Texas.

Status: Has FPC approval.

Project: 140 miles of 30-in. between Kosciusko, Miss., and Uniontown, Pa., 105 miles of 30-in. between Opelousas, La., and Kosciusko, 22 miles of 14-in. supply line in La.

Status: Pending FPC approval.

Project: 667 miles of 30-in. from Kosciusko Miss., to Uniontown, Pa.

Status: Under way.

Contractor: **H. C. Price Co.** (64 miles from Barton, Ala., to Mount Pleasant, Tenn.; 51 miles from Mount Pleasant to Gladeville, Tenn.; 52 miles from Gladeville to Tompkinsville, Ky.; 68 miles from Tompkinsville to Danville, Ky.; 63 miles from Danville to Owingsville; 46 miles from Owingsville to Wheelersburg, Ohio. Will use four spreads); **Williams Brothers Co.** (63 miles from Egypt, Miss., to Barton, Ala.; 64 miles from Berne, Ohio, to Uniontown, Pa.); **Houston Contracting Co.** (80 miles from Kosciusko to Egypt, Miss., M. L. Thompson, supt., office at Ackerman; 57 miles from Wheelersburg to Athens, Ohio, W. H. Hayes, supt., office at Oak Hill; 61 miles from Athens to Berne, Ohio, R. E. Thornton, supt., office at Chauncey).

Completion: Fall 1957.

• **Texas Illinois Natural Gas Pipeline Co.**

Project: 44 miles of 36-in. and 4 miles of 34-in. from south of Joliet, Ill., to Howard Street, west of Chicago.

Status: To start September 20, 1957.

Contractor: **Midwestern Constructors, Inc.**

Completion: Depends on pipe delivery.

• **Transcontinental Gas Pipe Line Corp.**

Project: 172 miles of 36-in., 68 miles of 30-in., 162 miles of 24-in., and 64 miles of smaller size loops from Tex. to N. J.

Status: Work in North Carolina under way.

Contractor: **Western Construction Co.** has 65 miles of 36-in. and 45 miles of 30-in. at scattered spots along system in S. C., N. C., Pa., and Va. Work will start in N. C., office at Winston-Salem.

Completion: December 1957.

Project: 110 miles of 36-in., 16 miles of 30-in., and 13 miles of 24-in. looping in S. Car., Ga., Ala., Miss., and La.

Status: Under way.

Contractor: **Sharman, Allen, Gay & Taylor, Inc.**, E. D. Singleton, superintendent.

Completion: November 1957.

Project: 57 miles of 30, 36-in. loops in La.,

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PI-5

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The Canadian Bank of Commerce maintains a complete Petroleum and Natural Gas Department in Calgary, and more than 270 branches throughout Western Canada. For information on any aspect of the industry in Canada, write or telegraph to C. H. Munro, Manager, Petroleum and Natural Gas Department, 309 Eighth Avenue, West, Calgary, Alberta.

(*We regret that we cannot advise on the merits of oil or mining securities.*)

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Pipeline Patrol

Miss., Ala., Ga., S. C., and 247 miles of mostly 24 and 16-in. laterals in Tex. and La.
Status: Under way.
Completion: December 1957.
Project: 87 miles of 24-in. laterals, plus small gathering lines connecting seven Louisiana fields with the New Orleans area.
Status: Pending FPC approval.

- **Trans-Western Pipe Line Co.** (Warren Petroleum, Monterey Oil Co., J. B. Butler.)

Project: A line from Four Corners area to Calif. border.
Status: Proposed.

- **United Gas Pipe Line Co.**

Project: 18 miles of 12-in. from Lirette-Mobile line in Jackson County, south to Bayou Casottee industrial area east of Pascagoula, Miss.
Status: Filed for FPC permit.

- **Western Slope Gas Co.**

Project: 36 miles of 4-in. from Piceance Creek field in northwestern Colo., to Rifle, Colo.
Status: Under way.
Completion: October 1957.

Canadian Crude-Oil Pipelines

- **Act Oils, Ltd.**

Project: A 450-mile line from the Peace River region of northern B. C. to tidewater at Bella Coola, B. C.
Status: Request has been made for permit from the B. C. government.

- **B-A Alberta Pipe Line, Ltd.**

Project: 35 miles of 8-in. to connect Drumheller field, Alberta, with existing lines running to Edmonton.
Status: Pending approval.

- **Pembina Pipe Line, Ltd.**

Project: 100 miles of 3 to 12-in. gathering line in Pembina oil field, Alta.
Contractor: **Universal Pipe Line, Ltd.**, subsidiary of Mannix, Ltd., T. Childress, spread superintendent, office at Drayton Valley, Alta. Grand Cheinier, La., and Forest Oil Co.'s
Completion: November 1, 1957.

- **Royalite Oil Co., Ltd.**

Project: 250-mile line from Athabasca oil sands, northeastern Alta., to Edmonton.
Status: Long range plans
Completion: 1960.

- **Westspur Pipe Line Co.**

Project: 20 miles of 12-in. from Alida in southeastern Saskatchewan, to the Carnduff-Glen Ewen area to tap Cantal, Hastings, Florence, Carnduff, and Glen-Ewen fields: 34 miles of 4, 6, 8-in. gathering lines.
Status: Has requested permit from Board of Transport Commissioners.
Contractor: **Majestic Contractors, Ltd.**, Jeff Minter, supt., office at Estevan, Sask.
Completion: **No date set.**

Canadian Products Pipelines

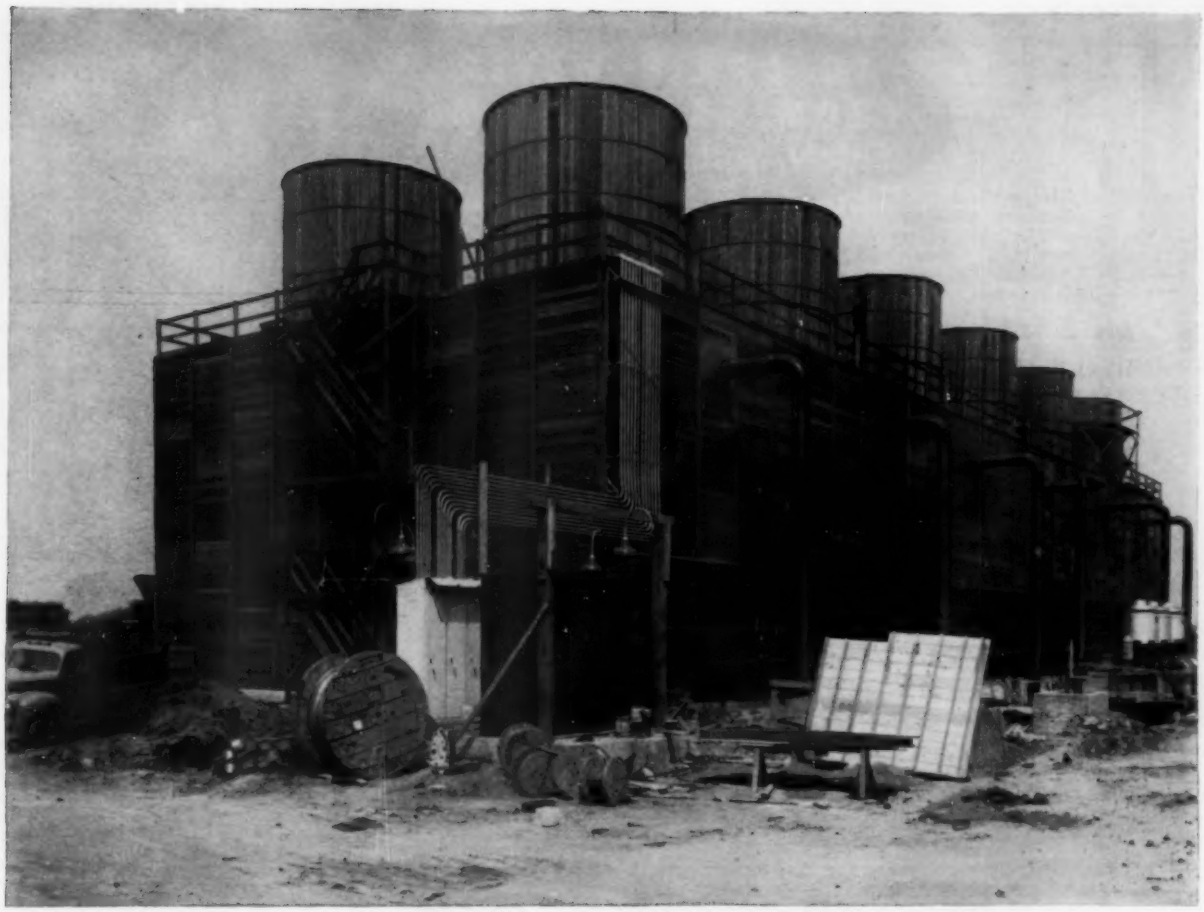
- **Hydrocarbons Pipeline Co.**

Project: 800 miles of 6 and 8-in. L.P.G line from near Edmonton, Alta., to Fort William, Ont.
Status: Has permit from Parliament of Canada. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas Conservation Board, work will start in 1957.
Construction consultants: **Dutton-Williams Brothers, Ltd.**, and **A. D. Little Co.**

Canadian Natural-Gas Pipelines

- **Alberta Gas Trunk Line Co., Ltd.**

Project: 637 miles of 34 to 16-in. gathering lines in Alberta.
Status: Under way.
Contractor: **Dutton-Williams Brothers, Ltd.** has preliminary studies, design and management-engineering. **Universal Pipe Line, Ltd.**



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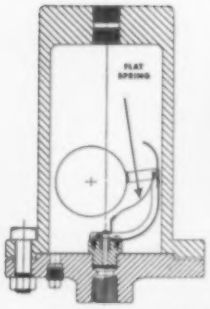

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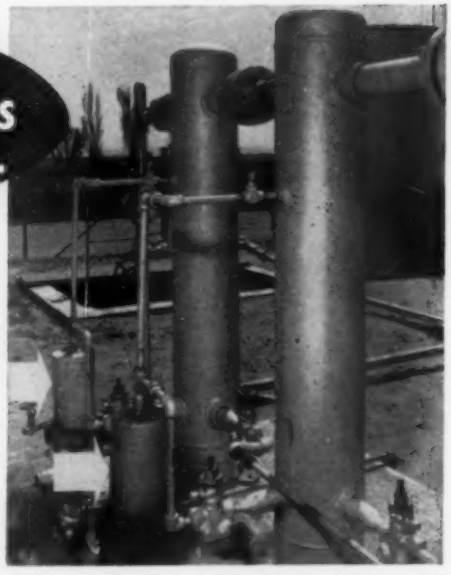

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Pipeline Patrol

subsidiary of Mannix, Ltd., jointly with **Marine Pipeline & Dredging Co.**, has crossing of Red Deer River near Cavendish, Alta., J Hysuick, spread superintendent, office at Empress. **Fulton Banister, Ltd.**, has completed 17 miles of 34-in. west from Burstall, Sask., to near Cavendish, Alta., and has under way 100 miles of 18-in. north to Bindloss and Provost fields, George Caron, supt., office at Oyen, Alta., to complete summer 1957.

- **North Canadian Oils, Ltd.**

  Project: 47-mile extension into Jasper, Alta., of its 10-in. line from Wabamun to Hinton west of Edmonton.

- **Northern Ontario Pipe Line Crown Corp.**

  Project: 675 miles of 30-in. from the Ontario-Manitoba border to near Kapuskasing, Ont. (part of the 2,250-mile Trans-Canada line; will be leased to Trans-Canada Pipe Line Co. with option to buy.)

  Status: 79-mile section from Stedman to Forham Township under way.

  Contractor: **Dutton Williams Brothers** has 58 miles from the Manitoba-Ontario border west of Kenora to a point east of the crossing of Ontario Highway 17. **Morrison Shivers, Ltd.** has 94 miles from the east crossing of Highway 17 to a line separating the townships of Hyndman and Hodgson. **Majestic Contractors & Associates** has 80 miles from the Morrison Shivers terminal to Stedman Township. **Houston Contracting Co.** has 79 miles from Stedman to Forham Township, R. L. Silar, supt., office at Raith, Ont.

  Contractor: **River Construction Corp.**, has Winnipeg River crossing near Kenora, Ont. to complete November 15, 1957.

  Completion: End 1957.

- **Provo Gas Producers, Ltd.**

  Project: 22 miles of 3 to 12-in. gathering lines and wellhead tie-ins in Provost Field, Alta.

  Status: Under way.

  Contractor: **Fulton Banister, Ltd.**, Jim Boyce, supt., office at Consort.

- **Trans-Canada Pipe Lines, Ltd**

  Project: 310 miles of 20-in. from Toronto to Montreal, 33 miles of 24-in. from Toronto to Niagara, N. Y.

  Status: Under way.

  Contractor: **Oklahoma Pipe Line Constructors** (83 miles of 20, 24-in. between Toronto and Montreal, and between Toronto and Niagara, N. Y.); **Grayco Constructors, Inc.** (120 miles of 20-in. between Toronto and Montreal).

  Completion: 1957.

  Project: 82 miles of 30-in. from near Winnipeg to the Ontario-Manitoba border.

  Status: Under way.

  Contractor: **Majestic Contractors, Ltd.**, K. B. Killingsworth, spread superintendent, office at Ste. Anne, Man.

  Completion: October 15, 1957.

- **Union Gas Co. of Canada, Ltd.**

  Project: 142 miles of 26-in. from Dawn Township to Hamilton, Ontario, plus 55 miles of 6 to 20-in. laterals, and 317 miles of 2 to 12-in. distribution lines.

  Status: Under way.

  Contractor: **Canadian Bechtel, Ltd.** has the 26-in. line, to complete November 15, 1957, office at Galt, Ont.

  Completion: November 30, 1957.

- **Westcoast Transmission Co., Ltd.**

  Project: 42 miles of 20-in. and 100 miles of 30 in. from Savanna Creek area, Alta., to Canadian-Idaho border.

  Status: Planned.

  Completion: November 1, 1958.

Foreign Crude-Oil Pipelines

- **Bolivian Gulf Oil Corp.**

  Project: 160 miles of 10-in. and 43 miles of 8-in. from Sicascia to Arica on the Chilean coast.

  Status: To start late 1957.

  Contractor: **Williams Brothers Co.**

  Completion: 1958.

- **Bolivia-Paraguay**

  Project: 500 miles of 6-in. from Southeast Bolivia to a proposed refinery on Paraguay River, and later to Asuncion.

  Status: Planned.

  Contractor: Five Lilles, a French Combine.

- **Burmah Oil Co., Ltd.**

  Project: 850 miles of 20-in. from Nahorkatiya to Calcutta, India.

  Status: Survey under way.

  Contractor: **Collins Construction Co.** is surveying locations for some 40 river crossings.

- **Caltex**

  Project: 30 miles of 30-in. from Duri field in Sumatra to Dumai where a deepwater terminal will be built. Line will be extended 35 miles to Minas field later.

  Status: Planned.

  Completion: Duri-Dumai line to be finished in 1959; extension to Minas later.

- **Colombian Petroleum Co.**

  Project: 42 miles of 6-in. from Tibu field to Rio de Oro in Colombia.

  Status: Under way.

- **C.R.E.P.S., Societe Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal), and Cie. Francaise des Petroles Algerie**

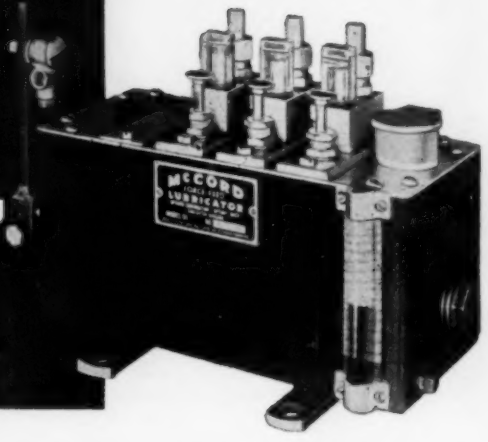
  Project: Two 10-in. lines from Hassi Messaoud and Edjele, Algeria to the railhead at Touggourt.

  Status: Planned.

  Completion: 1958.

  Project: 450 miles of 16-in. from Edjele field in southeastern Algeria to a Mediter-

FEATURES THAT MAKE McCORD *Model 55* The Outstanding Lubricator in the Oil Industry



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Send for your copy of the interesting bulletin on McCORD MODEL "55" LUBRICATOR.

LUBRICATOR DIVISION McCORD CORPORATION · Detroit 11, Mich.

Pipeline Patrol

ranean port on the Libyan coast.
Status: Pipe has been ordered.

• **Creole Petroleum Corp.**
Project: 87 miles of 30-in. from Tembladora field to Caripito in Venezuela.
Status: To start work early 1958.
Contractor: **Pipe Line Engineering Co.** and **Oklahoma Pipe Line Constructors.**
Completion: April 1958.
Project: 9 miles of 26-in. from Ule to La Salina in Venezuela.
Status: Planned.
Completion: Late 1957.

• **Deutsche-Shell A.G.**
Project: 120 miles of 20, 24-in. from Marseilles, France, to Rotterdam, Germany, to tap the 700 mile trans-Europe line proposed by the Royal Dutch-Shell Group.
Status: Planned.
Completion: 1960.

• **Iraq Petroleum Co.**
Project: About 600 miles of up to 40-in from Kirkuk field through Iraq to Turkish port of Iskenderun on the Mediterranean.
Status: Proposed. Survey completed.

• **Mene Grande Oil Co.**
Project: 97 miles of 30-in. from fields in Eastern Venezuela to Puerto La Cruz.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** has 22 miles between Oficina and Anaco.
Completion: First quarter 1958.
Project: 45 miles of 24-in. from Oficina to Melones, Venezuela.
Status: Planned.
Completion: First quarter 1958.

• **Middle East Pipeline**
Project: 1,500 miles of 38 and 40-in. line from Persian Gulf to Mediterranean at Iskenderun, Turkey.
Status: Proposed.

• **National Iranian Oil Co.**
Project: A 1,000-mile 38-in. line to move Qum crude to the Mediterranean.
Status: Transit agreement approved.

• **North-West Oil Pipeline Co.** (newly formed by six West German refiners, headed by affiliates of Standard Oil Co. (N.J.), and British Petroleum Co., Ltd.)
Project: 230 miles of 28-in. from refining centers in the industrial Ruhr area of West Germany to Wilhelmshaven.
Status: Work to start early 1958.
Completion: November 1958.

• **Royal Dutch-Shell**
Project: 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, and Netherlands, and Belgium. Main trunk to be 30-in.
Status: Company is considering project together with several other companies.

• **Standard-Vacuum Petroleum Maatschappij.**
Project: 94 miles of 8-in. from Lirik field, Central Sumatra, to deep-water terminal on Siak River, near Buatan. A 3-in. hot-water "defroster" line will be laid under the 8-in. to heat the heavy crude.
Status: Under way.
Completion: Late 1957.

• **Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie**
Project: Line in Sahara Desert area to move oil from Hassi Massaoud field. Two routes possible: 200 miles from the field northwest to Laghouat; 260 miles from the field to the north and slightly east to Biskra.
Status: Under study.

• **Union of Soviet Socialist Republic**
Project: 2,300-mile Trans-Siberian crude-products line from Ufa Tuimaza fields in Bashkiria to Irkutsk near Lake Balkal.

• **Yacimientos Petrolliferos Fiscales (Argentina)**
Project: 932 miles of 12-in. from Campo Duran to San Lorenzo.
Status: Planned.
Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.).
Project: 625 miles of 12-in. from Mendoza to San Lorenzo.
Status: Planned.

Foreign Products Pipelines

• **Empresa Nacional de Petroleos** (Government of Chile) and **Cia. de Petroleos de Chile (Copec), et al.**
Project: 75 miles of 10-in. from Chile's coastal refinery at Concon to Santiago.
Status: To start work September 1957.
Contractor: **Williams Brothers**
Completion: Early 1958.

• **Israeli Government**
Project: A 6-in. line from the Haifa refinery to Tel Aviv.
Completion: Late 1957.

• **Mene Grande Oil Co.**
Project: 60 miles of 6-in. L.P.G. line from Anaco to Puerto La Cruz, Venezuela.
Status: Planned.
Completion: Fourth quarter 1957.

• **North Atlantic Treaty Organization**
Project: 2,000 miles of lines to airfields in parts of Europe.
Status: Under way.
Contractor: **Associated Pipeline Contractors, Inc.** (450 miles from Iskenderun, Turkey to Batman); **TECHINT** (205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir).

Foreign Natural-Gas Pipelines

• **Attock Oil Co.**
Project: 60 miles of line from Dhulian field

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Midwestern's leadership in the field of pipeline corrosion control is the result of aggressive service practices, together with the most improved materials available . . . KAPCO Rock Shield — for pipe protection in rocky areas . . . "GLASFAB" Hot or Cold Dope Wrap — for emergency pipe line repairs . . . Owens-Corning Fiberglas COROMAT — for reinforcing enamel for lifetime protection of underground pipe . . . GLASKOTE handy tape for pipeline joint and fitting wrapping . . . KEYSTONE Asbestos Felt — for high impact and soil acid resistance.

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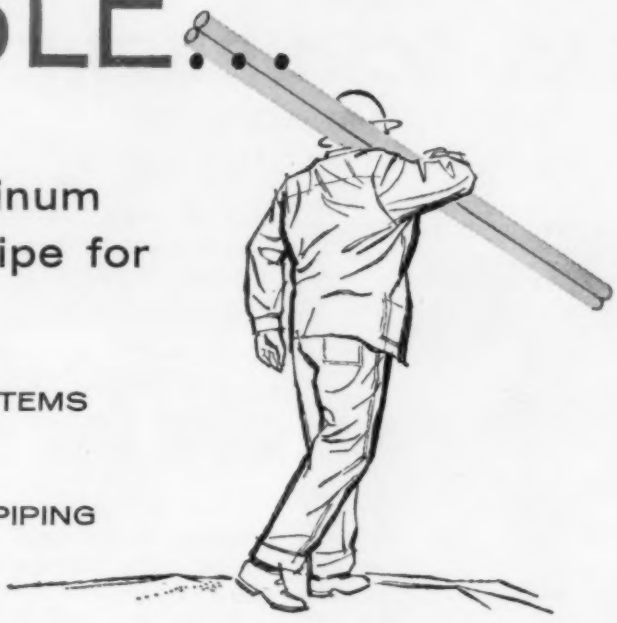

Alcoa Aluminum Oil Country Pipe for

WATER SUPPLY

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GAS LINES

TANK BATTERY PIPING

VENT LINES

Portable piping plays a major role in efficient oil field operations. Here's why it will pay you to specify light, strong ALCOA® Aluminum Pipe for your portable piping needs:

PORTABLE . . . One man can easily handle several standard lengths of ALCOA Aluminum Pipe. Small crews can quickly and easily lay long lines of pipe. Pick-up and relaying is just as easily accomplished.

ECONOMICAL . . . Quick, easy handling by small crews means low laying costs. And extra long service life adds extra savings.

DURABLE . . . Rugged ALCOA Aluminum Pipe stands up under heavy abuse when laid or strung from supports over the roughest terrain. And aluminum is highly resistant to corrosion under severe conditions.

Operating efficiency of ALCOA Aluminum Pipe is excellent. It has the same friction factor as smooth drawn tube of other metals, insures low loss of head.

ALCOA Aluminum Pipe and quick couplings of aluminum are immediately available—through most major oil field supply companies. You'll find them listed in the Yellow Pages of your telephone directory. Check your distributor for a complete list of sizes available . . . or use the handy coupon.

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Pipeline Patrol

to Rawalpindi in West Pakistan.
Status: Planned.

• **Cuban Gas Transmission Co.**
Project: 650-mile pipeline from Campeche area of Mexico across Yucatan and on the ocean floor to Havana, Cuba; 150 miles would be submarine.
Status: Being studied by Ebasco Services.

• **Gaz de France**
Project: 550 miles of 16 to 24-in. from Lacq field, southwestern France, to Paris, plus a 10-in. lateral to Nantes and 12 to 16-in. laterals to Lyons, making a 1,000-mile system.
Status: Under way.
Contractor: French contractors.
Completion: First stage in 1958; complete system in 1960.

• **NIOGAS**
Project: 160-mile, 6, 8, 10, and 12-in. line from Fischamend field to Vienna and other Austrian cities.
Status: Under way.
Contractor: **Williams Brothers and Costain-John Brown.**
Completion: Fall 1958.

• **Petroleos Mexicanos**
Project: 130 miles of 22-in. to parallel a 14-in. line from Reynosa to Monterrey.

• **Sui Gas Transmission Co.**
Project: 217 miles of 16-in. from Sui gas field to Moultan, Pakistan.
Status: Under way; to be extended later to Lahore with branches at Kot Addu, Jhang Magiana, and Montgomery.
Contractors: **Pakistan Constructors,** a joint company of **Morrison-Knudsen** of Boise, Idaho, and **William Press, Ltd.,** of London.
Project: 145-mile line from Sylhet to Dacca, East Pakistan.
Status: Under consideration. If approved construction could start December 1958.

• **Technical Office of Hydrocarbon, Ministry of Mines and Petroleum, Government of Venezuela.**
Project: 207 miles of 26-in. from Anaco fields to Caracas.
Status: Under way.
Contractor: **Fulghum Contracting Corp.** will be consultants; **Petrogas, S. A.** will engineer and construct the line.
Completion: Spring 1959.

• **Union of Soviet Socialist Republic.**
Project: 808 miles of 26-in. from Stavropol in the Northern Caucasus to Moscow, to serve Voroshilovgrad, Voronezh, Tula, Yelets, and Serpukhov.

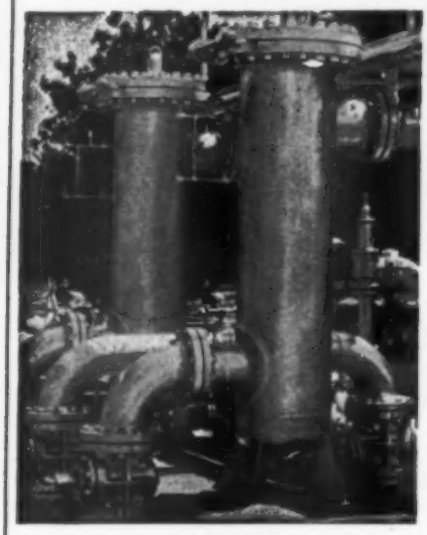
• **Yacimientos Petroliferos Fiscales (Argentina)**
Project: 1,015 miles of 24-in. from Camp Duran to Buenos Aires.
Status: Planned.
Contractor: **TIPSA** (Fish Engineering Corp., Fish Northwest Constructors, Inc., Clark Brothers, North American Utility, Construction International Co.).

MOORLANE

GAS SCRUBBERS

AN ESSENTIAL ACCESSORY

FOR ALL GAS PIPE LINE SYSTEMS



Sizes available are 4-inch through 18-inch diameter vessels for any working pressure.

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Scrubber is dry type. No oil carry-over to worry about.

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Filter medium is wool felt.

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Removes all particles 5 microns (.0002") in size, and larger.

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TULSA 1, OKLAHOMA

Aramco Installs Remote Control And Telemetering System

A RECENT innovation in pipeline control is the remote centralized control and telemetering system installed on the Arabian American Oil Co. crude line. The system is located at Tufaih, an unattended satellite pump station between Qaisumah and Qatif in Saudi Arabia. The equipment was designed and manufactured by Union Switch & Signal - Division of Westinghouse Air Brake Co.

The system includes electrical instrumentation, data - processing units, tone-shift terminals, U.H.F. radio equipment, and satellite-station control and monitoring equipment. These units are permanently mounted in a large trailer van. They operate in conjunction with a 5,000-hp. gas turbine, a crude-oil pump, combustion-air filtering equipment, measuring instruments, turbine-sequence control, and generator.

The station is made up of four mobile vans housing the above equipment. The Tufaih booster is part of an expansion of the Aramco and Trans-Arabian Pipe Line Co. system which is adding five new turbines (OGJ, June 3, p. 85).

A base station control cabinet is located at Abqaiq, several miles from the satellite station. This cabinet has function switches, visual and digital readout of variables at frequent intervals. It will automatically print this information on a standard, marginally punched continuous form on an electric typewriter to provide a permanent log.

Variables telemetered regularly to the base control station include suction and discharge pressure, discharge pressure controller set-point, turbine inlet air temperature, and turbine speed. The operator also has an immediate reading of any of these variables by pushing a button.

Natural Gas Pipeline Company of America Finds GAS LINE LIKE NEW AFTER 27 YEARS!

Bitumastic coal-tar enameled pipe to be re-used

In relocating its line to make way for a new highway near Truro, Iowa, the Natural Gas Pipeline Company of America removed some 900 feet of Bitumastic® enameled pipe laid in 1930. According to Mr. D. C. Allen, District Superintendent, this 24-inch seamless steel tubing is in such good condition that it will be reconditioned and used again as new pipe.

Applied by the rolling and "granny-rag" method in 1930, the Bitumastic XXH Enamel on this line was in excellent condition. The asbestos-felt overwrap, originally applied loose, was torn from soil stresses, but the Bitumastic enamel coating showed no serious disbonding or deterioration. At the time of relocation, the section had been under cathodic protection for two years. Natural Gas Pipeline Company of America records show no corrosion leaks on this section during the entire 27-year period underground.

Case histories such as this from prominent pipeline companies prove the unmatched protective ability of coal-tar enamel. In these days of rising material costs, you can't afford to gamble your entire pipeline investment on a less effective coating.

Your Koppers representative will be glad to give you full information on the superior protection of Bitumastic coal-tar enamels. Koppers District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh, and Woodward (Birmingham), Alabama.

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Ten AAF Cycoils deliver clean air to the 660 hp. engines driving pumps at the Ward-Estes Water Flood Project.

AAF Cycoils protect engines—require minimum maintenance

When engines are driving pumps for high-volume water injection used in secondary recovery, down-time means decreased production. That's why only the best protection against dust and dirt is good enough. At the Ward-Estes Water Flood Project, Ward County, Texas, ten AAF Cycoils do the job.

AAF Cycoil oil bath air cleaners require an absolute minimum of maintenance. It is not necessary to tear them down for cleaning. Due to self-cleaning action of the filter pads, the only maintenance needed is the periodic replacement of oil. Records show that Cycoils have been on the job in some applications for as long as 20-years without being dismantled for maintenance.

Cycoils offer many advantages—uniform air delivery, constant efficiency, low operation resistance, minimum maintenance. Get all the facts on AAF Cycoil oil bath air cleaner right away. Write today for Bulletin 130.

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AAF American Air Filter COMPANY, INC.

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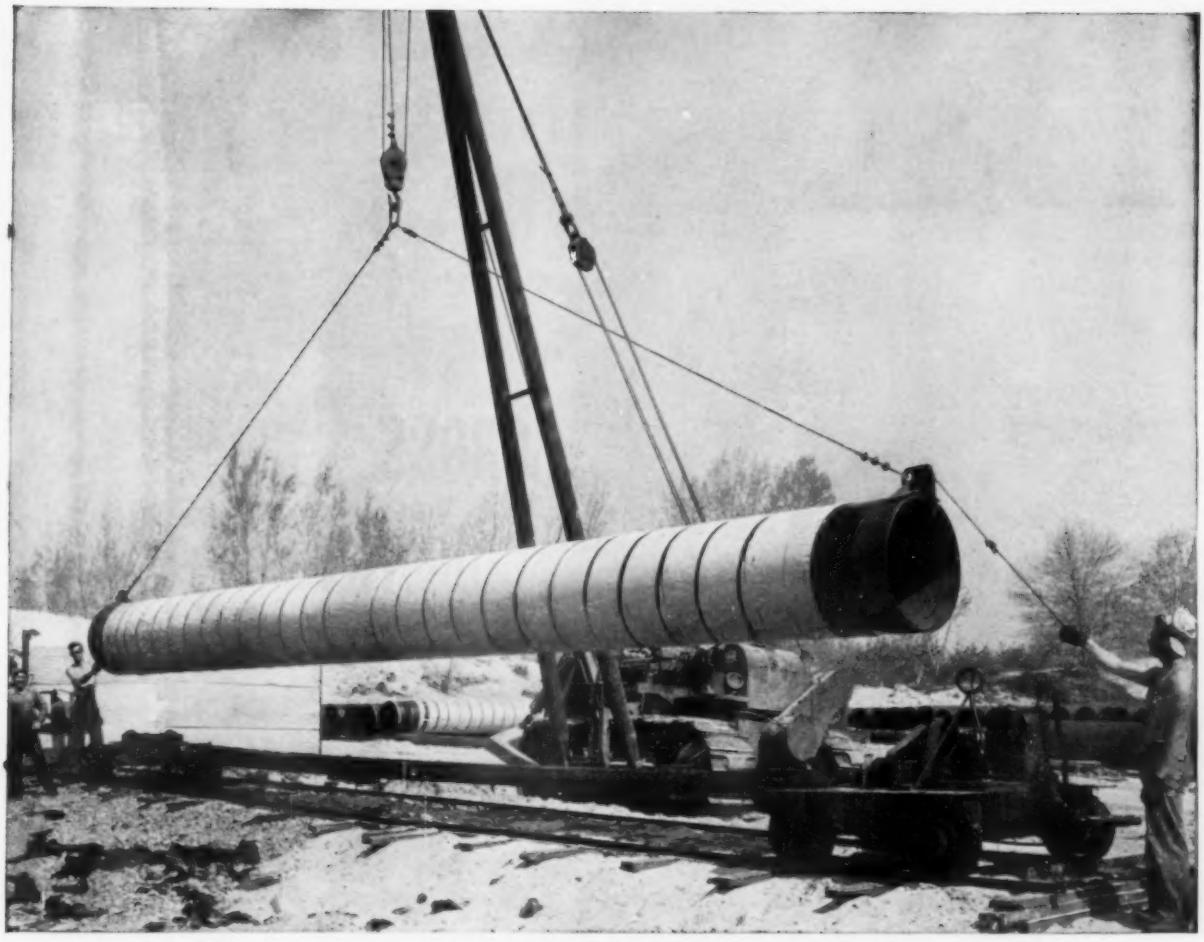
American Air Filter of Canada, Ltd., Montreal, P. Q.



ANOTHER LINK IN A MILLION-MILE CHAIN

This 30-foot section of pipe has been coated, wrapped, and is ready for service. It will take its place in the vast underground pipeline network that moves a greater volume than do trucks, railroads, ships and planes, combined.

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But there are problems—and one of the most important of these is corrosion. Pipeline companies and utilities must protect their metal pipe against the many corrosive elements that exist underground.

That's where Dearborn comes in. Dearborn's complete line of NO-OX-ID Coatings and NO-OX-IDized Wrappers provide both chemical and mechanical protection against moisture penetration and soil action—protection that lasts for decades—under ground or under water. That's why leading pipeline companies and utilities everywhere look to Dearborn for long-term protection against corrosion leaks and deterioration.

We will gladly consult with your engineers on the best NO-OX-ID Coating and Wrapper Combination for your next pipeline job.

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☐ Please send details on NO-OX-ID Combinations.
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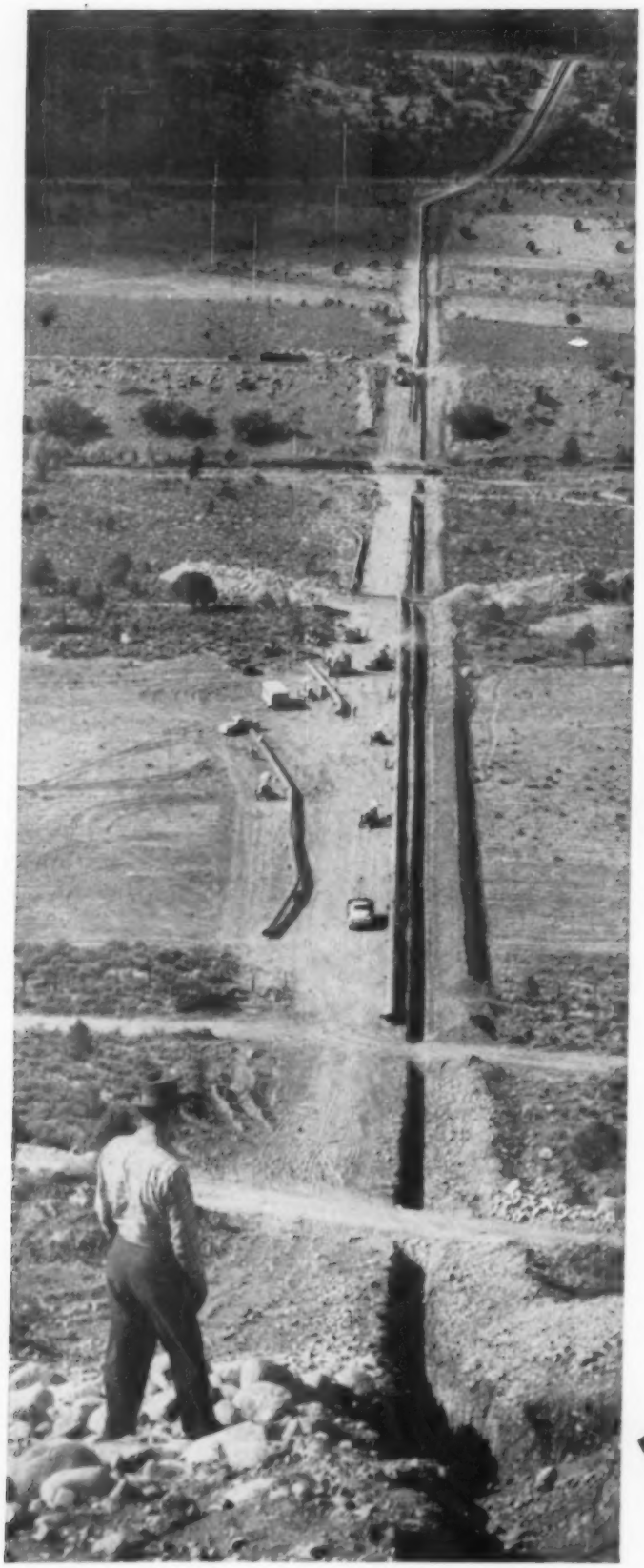


CROSS COUNTRY CHAMP!

When the going gets rough and the miles start stretching out . . . that's when you appreciate the quality of Kaiser Steel line pipe.

Here's pipe that's made for rigorous conditions. *Precision* pipe that in every length assures the kind of true uniformity that makes handling easier, installation quicker.

Kaiser Steel's fully-integrated western operation assures quality control—permitting no less than 52 tests and inspections from mine to market.

Result: in diameter, concentricity, ductility, strength . . . wherever accuracy and performance count most . . . you can count on pipe of Kaiser Steel to pay off for you in the field.

Kaiser Steel

Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

for cooling tower application...

There's MORE protection against humidity in Allis-Chalmers MOTORS

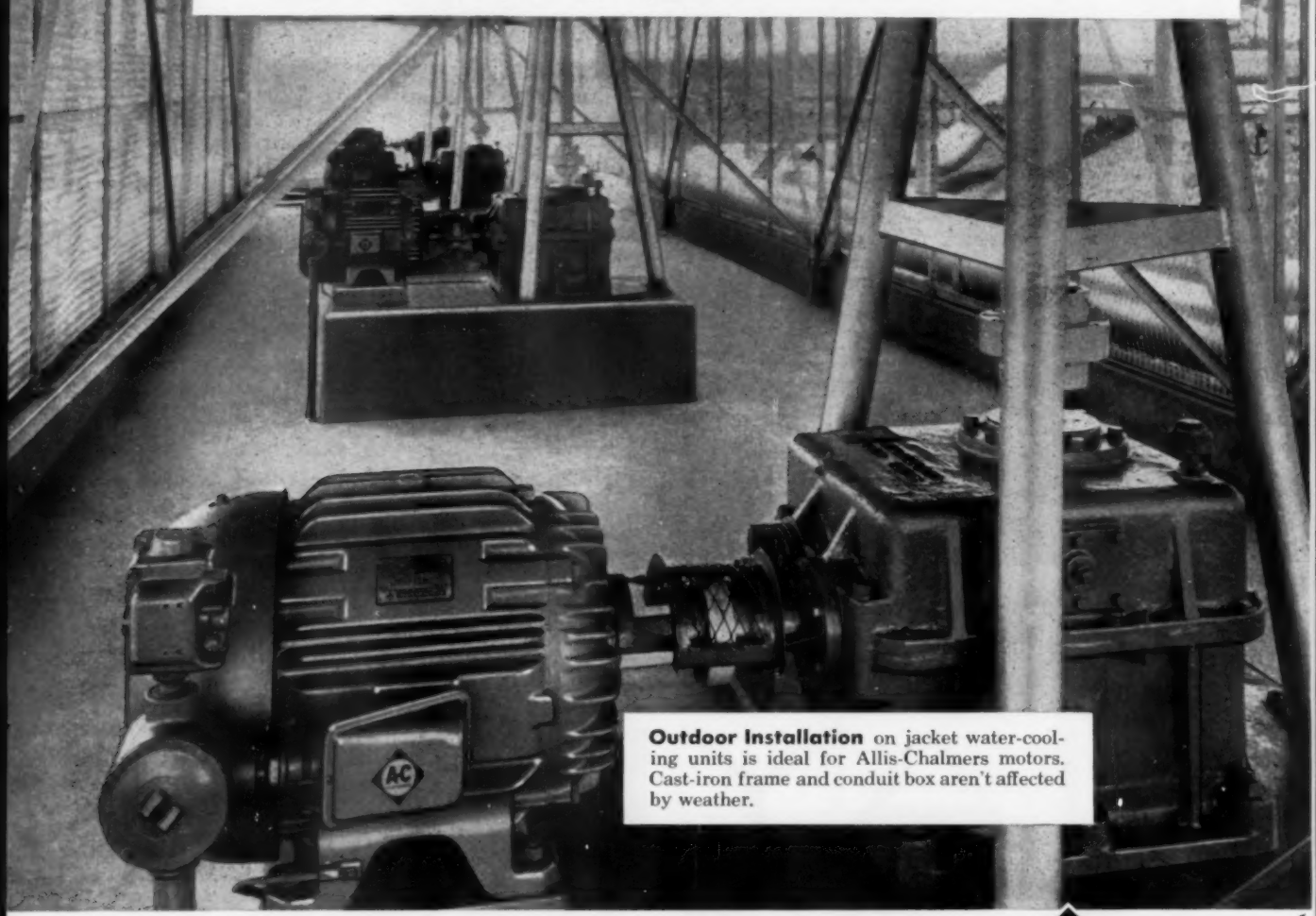
The ultimate in protection against high humidity — major cause of cooling tower motor failure — is provided tower builders and users in Allis-Chalmers TEFC motors. Here's why:

1. **Moisture drainage** — Drain plug can be removed to eliminate condensed moisture in the motor. (Particularly helpful in intermittent operations where condensation is more likely.)

2. **Extra-insulated stator** — Several applications of special insulating varnish plus repeated baking keep humidity out . . . give the long electrical life you need.

3. **Weather-protected bearings** — Rotating seal, turning in close running clearances, guards against entry of water.

Find out more about the "MORE" in Allis-Chalmers motors by contacting your nearby A-C sales office or distributor, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wis.



Outdoor Installation on jacket water-cooling units is ideal for Allis-Chalmers motors. Cast-iron frame and conduit box aren't affected by weather.

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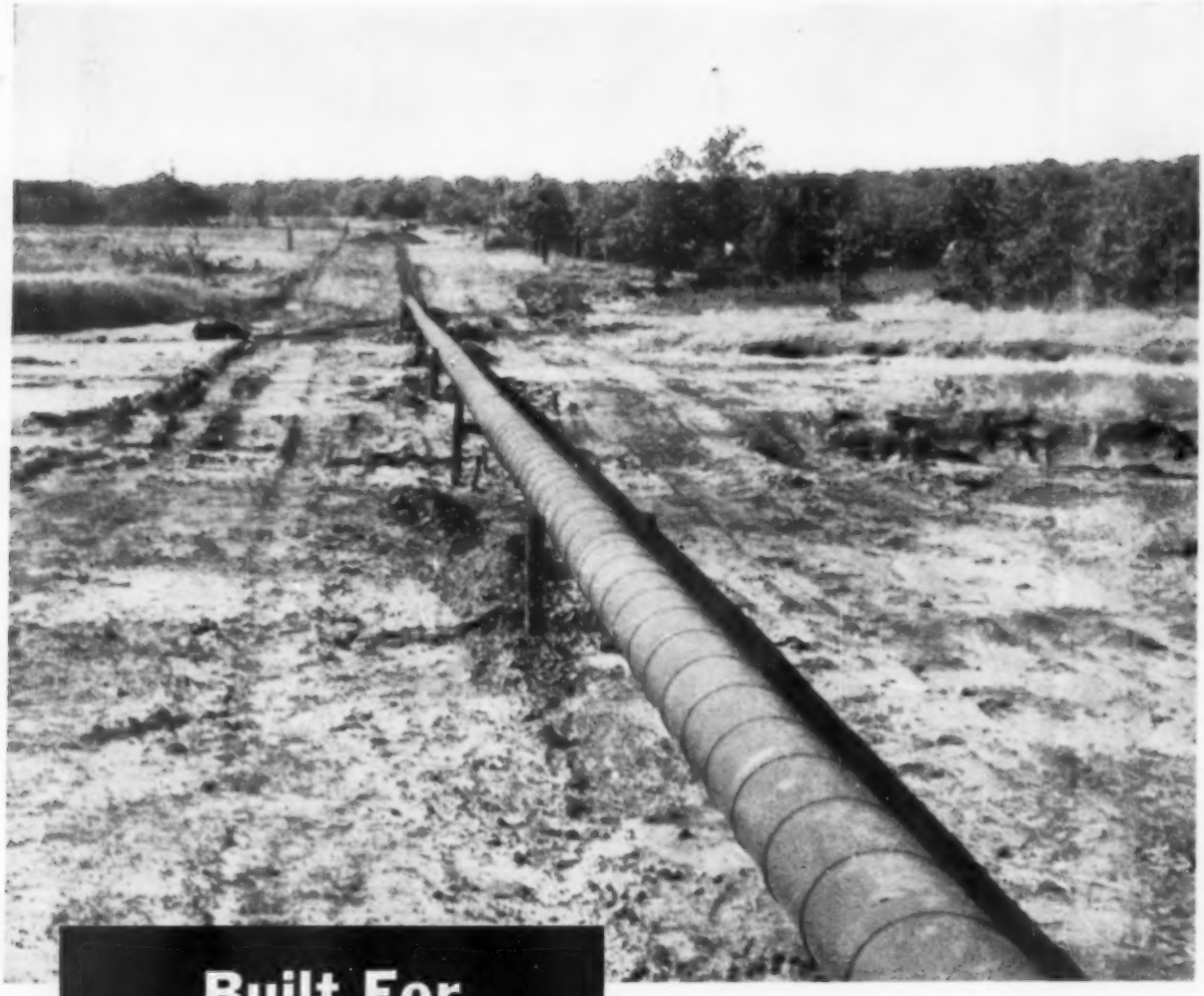

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If you are looking for greater strength and safety in your gas-gathering lines, consider the extra performance built into NAYLOR Spiralweld pipe. The exclusive spiral lock-seam structure enables this light-weight pipe to absorb shock loads, stresses and strains . . . and assures extra strength against collapse.

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EXCLUSIVE DISTRIBUTORS IN MID-CONTINENT AND GULF COAST AREAS

MID-CONTINENT SUPPLY CO.
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It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

No internal wearing parts.

No valves, pistons, or vanes.

No internal lubrication.

Low maintenance cost.

Saves floor space.

Desired delivery temperature automatically maintained.

Slugs of liquid entering pump will do no harm.

75 pounds in a single stage.

NASH ENGINEERING COMPANY

313 WILSON, SO. NORWALK, CONN.

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Polyken No. 900—12 mils, the original all-inclusive tape coating for straight-run applications.

Polyken No. 920—20 mils, thick and tough for heavy-duty use on straight runs, yet it's conformable, too.

Polyken No. 940—12 mils, just the right balance between elasticity and super-conformability for use on irregular pipe structures.

Only if you use a *Polyken* polyethylene tape on *accessory* jobs are you getting the most for your money

Whatever your need in accessory tape coatings, you will find a *better* solution at *lower* cost with one of these Polyken tapes.

Top corrosion fighter

Why Polyken? Because only Polyken has successfully developed the complete line of polyethylene tape coatings. And no other tape coating—*absolutely none*—can match the remarkable properties of Polyken polyethylene:

- **tough and elastic**
- **unplasticized, non-drying film**
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Compare the cost of each Polyken tape with that of the competitive tape it surpasses. See for yourself on your next purchase order.

Here is your Polyken Distributor . . . Contact him now.

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San Francisco, Calif.: Aetna Sales Co.
Seattle, Wash.: Farwest Corrosion Control Corp.
Seattle, Wash.: Pacific Water Works Supply Co.
Tulsa, Okla.: William Cluff Corp.

Complete catalog, Sweet's Industrial Construction File, Sec. 31/6

Polyken®

PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

Pumper in Reagan County, Texas, equipped with an Allen-Bradley Bulletin 1242 oil well pump control in weatherproof, Type 3 enclosure. Safety doors are opened, below, to show electrical switching equipment.

SAFETY
for man, motor, and pumper

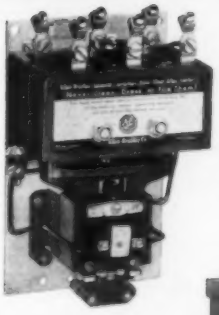
For motor drives that are left pretty much to themselves . . . like oil well pumpers . . . starter maintenance can be a real problem.

Allen-Bradley pumper controls are good for millions of trouble free operations. For their silver alloy contacts . . . which are always in perfect operating condition . . . once-a-year inspection would be a generous maintenance schedule. You can install Allen-Bradley solenoid starters and virtually forget them.

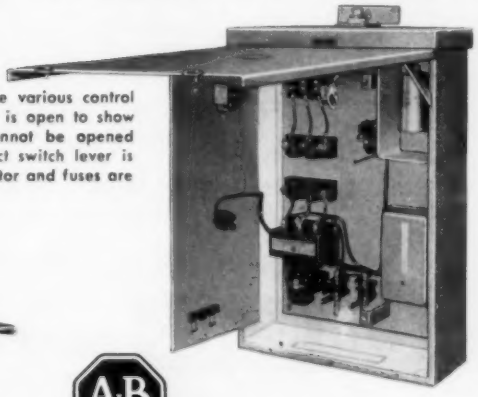
Bulletin 1242 oil well pump controls have a panel-mounted program time switch which enables the control to operate the motor according to a preset schedule.

The complete control comprises Bulletin 702 contactor, two Bulletin 815 manually reset overload relays, fused disconnect, undervoltage relay, lightning arrestor, time switch, and Hand-Off-Automatic selector, the setting of which determines whether the control is manually or automatically operated.

Allen-Bradley Co.
1304 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.



Bulletin 702 solenoid contactor has only one moving part . . . there are no pins, pivots, or bearings to corrode and stick. The magnetic plunger operates in a vertical frictionless guide.



At right are the various control units. The door is open to show contactor. It cannot be opened unless disconnect switch lever is OFF. The contactor and fuses are then "dead."

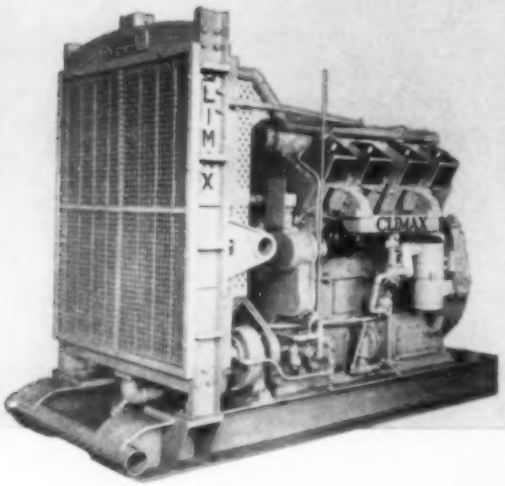
The outer door is raised to show the inner door of the contactor compartment. The time switch can be set without having access to the live switch and fuses.

ALLEN-BRADLEY
QUALITY
MOTOR CONTROL

THE BIG FEATURE ABOUT CLIMAX ENGINES

IS THE **OWNER SATISFACTION**

THEY PROVIDE . . . .



A Complete Line of Oil Field Engines up to 605 H.P.

. . . MIGHTY IMPORTANT TO CONSIDER WHEN YOU BUY AN ENGINE!

Here's why Climax Engines are so "owner satisfying"—

You get an engine that will give years of service on any job . . . whether powering drilling rigs, pumps, compressors or generators.

—an engine designed for easy starting . . . simplified operation . . . equal efficiency on natural gas, butane or gasoline by merely closing one set of valves and opening another . . . easy maintenance . . . readily accessible operating parts and accessories.

—an engine backed by prompt service throughout the oil country . . . friendly Climax Distributors offering a complete stock of parts, repair facilities and factory trained mechanics.

—these, plus many other Climax advantages, add up to owner satisfaction . . . the kind you get when you buy Climax Engines!

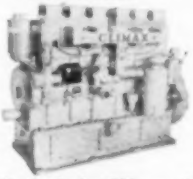
See, call or write your nearby Climax Distributor today!

V-125—12 cylinder, 605 max. H.P. at 1200 R. P. M.

V-122—12 cylinder, 520 max. H.P. at 1200 R. P. M.

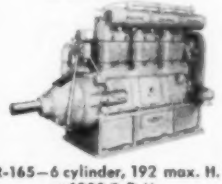
V-85—8 cylinder, 390 max. H.P. at 1200 R. P. M.

V-80—8 cylinder, 340 max. H.P. at 1200 R. P. M.



K-75—6 cylinder, 302 max. H.P. at 1200 R. P. M.

K-67—6 cylinder, 265 max. H.P. at 1200 R. P. M.



R-165—6 cylinder, 192 max. H.P. at 1200 R. P. M.

R-110—4 cylinder, 130 max. H.P. at 1200 R. P. M.

CLIMAX ENGINE MANUFACTURING COMPANY

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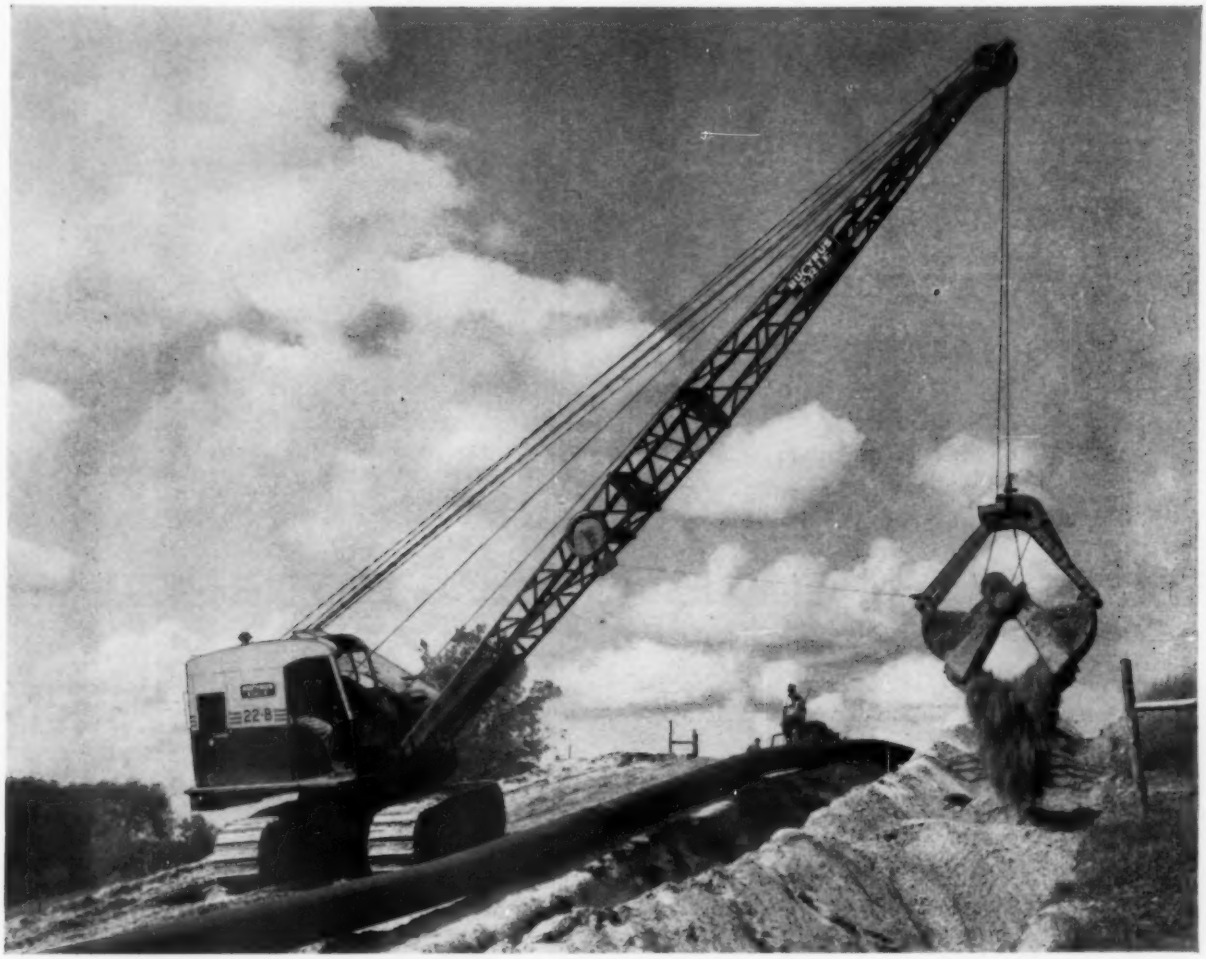


Bucyrus-Erie 22-B Clamshell Speeds Pipeline Ditch Cleanout

When the Michigan-Wisconsin Pipeline Co. began construction on a natural gas line from Oshkosh to Waukesha, Wis., this Bucyrus-Erie 22-B clamshell was chosen for ditch cleanout work. Shown here just south of West Bend, Wis., it was one of five 22-Bs on the spread. These machines helped keep things moving at a steady clip through terrain consisting of sand, clay, muck and rock.

The 22-B is built to work efficiently under adverse conditions. Optional tractor-type crawler mounting provides extra clearance for safe travel over rocks, stumps and most other obstructions normally encountered. Tractor-type treads have deep grousers for sure traction in soft ground and for climbing steep grades. Special sealing helps protect track-roller bearings against damage from water, dust, dirt, and grime.

Bucyrus-Eries offer the type of performance *and dependability* that keep jobs moving on schedule regardless of obstacles.

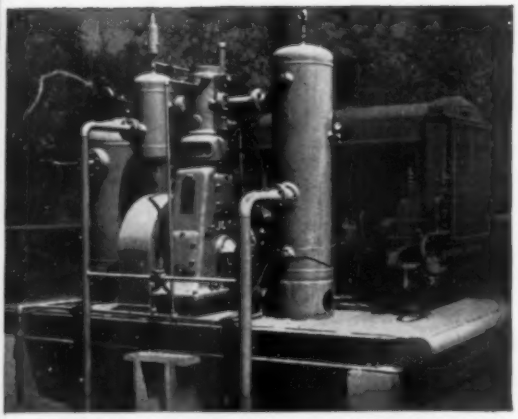
For more information on the rugged, high-output features of Bucyrus-Erie cranes and excavators, see your Bucyrus-Erie distributor today.

385E57

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

THE ONLY MODERN-DESIGN COMPRESSORS FOR GAS BOOSTER OPERATION



Joy WGB-110 Gas Compressor. Inlet pressure 150 psig; Discharge pressure 500 psig. Capacity 1.028 MMCFD.

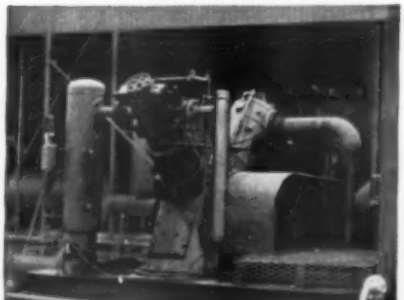
JOY *Packaged* GAS COMPRESSORS

Modern Joy Packaged Gas Compressors are backed by a century-old reputation for low maintenance and long service. These *time-proved* features make Joy Compressors the most reliable for gas gathering, repressuring, or gas lifting:

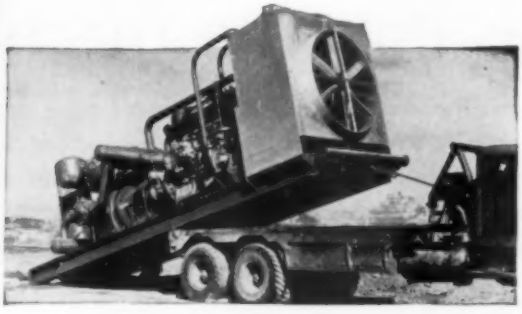
- **Field-replaceable cylinder liners.**
- **Field-replaceable crosshead guides.**
- **Patented Joy "Dual-Cushion" valves.**
- **Full force-feed lubrication.**
- **Anti-friction main bearings.**

Joy Gas Compressors are available in space-saving vertical, V-type, and semi-radial designs . . . single or two-stage units with cylinder sizes from 3" to 13½". Four different frame types accommodate a power range of 50 to 400 HP.

For the most efficient compressor for your needs, consult a Joy Engineer or write to ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Joy WNB-112 Gas Compressor. Inlet pressure 35 psia; Discharge pressure 665 psia. Capacity .85 MMCFD.



This photo of a Joy WNB-114 Gas Compressor Package being unloaded onto concrete pad clearly illustrates portability of unit. Inlet pressure is 5 psig; Discharge pressure is 150 psig. Capacity 2 MMCFD.

JOY ...EQUIPMENT FOR OIL FIELDS

Write for FREE Bulletin 84-31

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WHY PIPELINERS DEPEND ON GORMAN-RUPP PUMPS

How do you lay a pipeline? You dig the dirt. You blast the rock. You fight the water. And you try to stay on schedule.

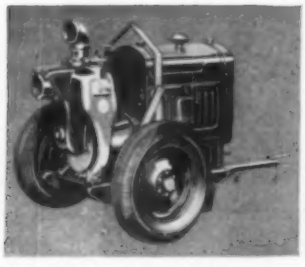
When it rains hard . . . or you hit a bog, that water can lick you. So you depend on Gorman-Rupp Pumps.

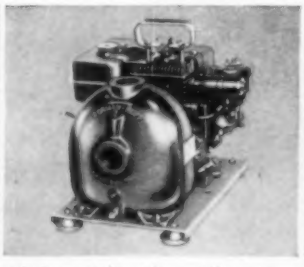
Laying pipelines, the pumping jobs come up in a hurry, require fast pumping. You dare not fail—so you call on Gorman-Rupp Pumps. They keep the job moving . . . whether for highways, dams, bridges, buildings . . . or for pipelines.

Pipeliners *know* Gorman-Rupp Pumps are "unsurpassed for pumping fast." You are near a Gorman-Rupp Distributor. In emergencies, telephone.

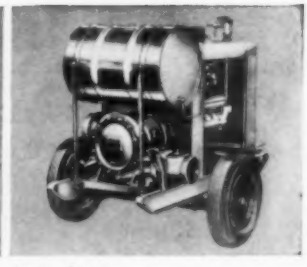
THE GORMAN-RUPP COMPANY

305 Bowman Street • Mansfield, Ohio


Contractors' Pumps — 3" to 10"

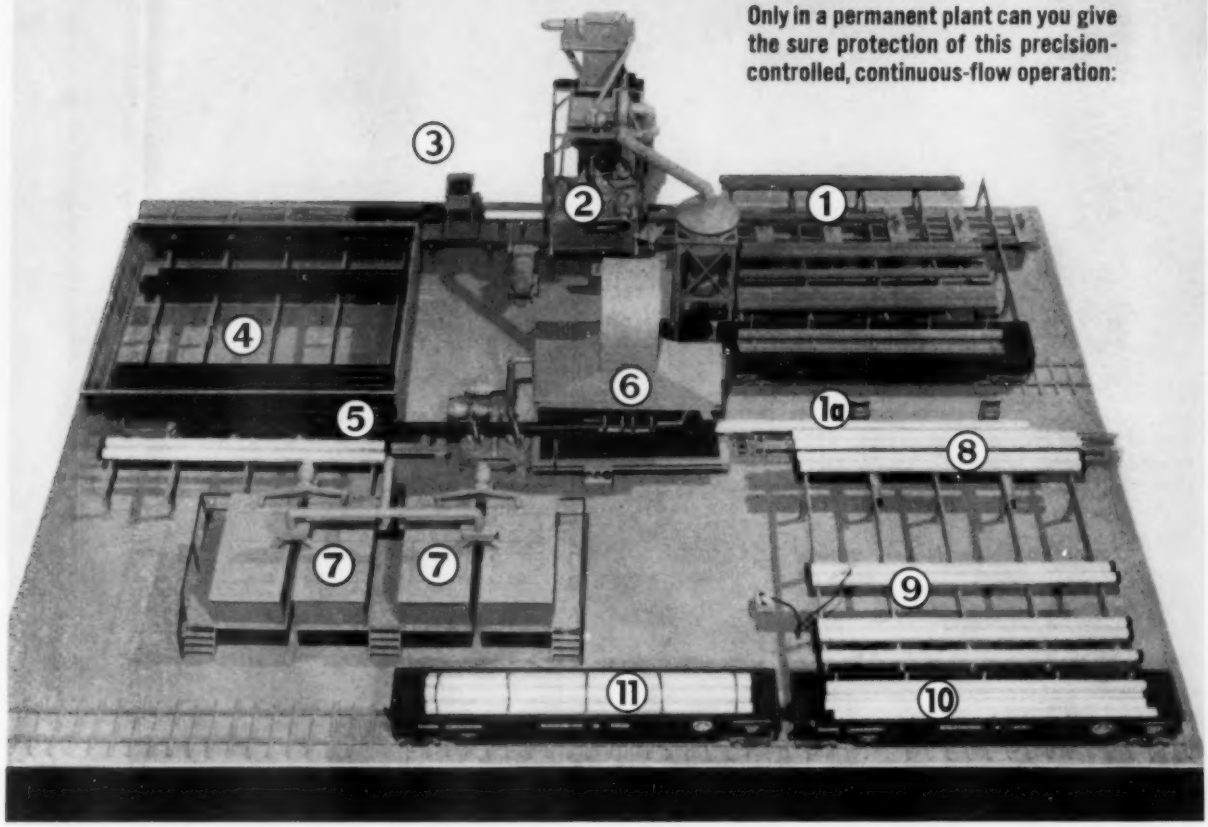

"80" Series Lightweights — 1½" to 3"

Diaphragm Pumps — 3" and 4"


Jetting Pumps

CONTINUOUS FLOW
makes this a model pipe wrapping plant

Only in a permanent plant can you give the sure protection of this precision-controlled, continuous-flow operation:



1. Caustically-cleaned pipe enters plant from yard.

1a. Bare pipe is unloaded direct from car in plant.

2. Roto-grit blaster removes all trace of rust, mill scale.

3. Machine applies primer.

4. Primer cures in heat room.

5. Automatic conveyor delivers pipe to—

6. Coating and wrapping machine.

7. Automatic kettles flow enamels to coating and wrapping machine.

8. Coated and wrapped pipe is delivered to an electronic-inspection area.

9. Holiday detector inspection area.

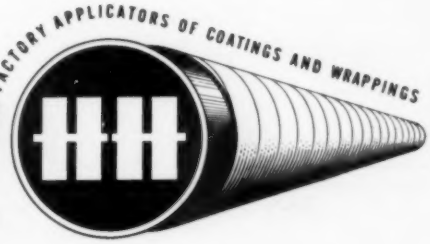
10. Pipe is loaded on flat car, according to specification MD-4, developed by Hill, Hubbell and given to the Association of American Railroads.

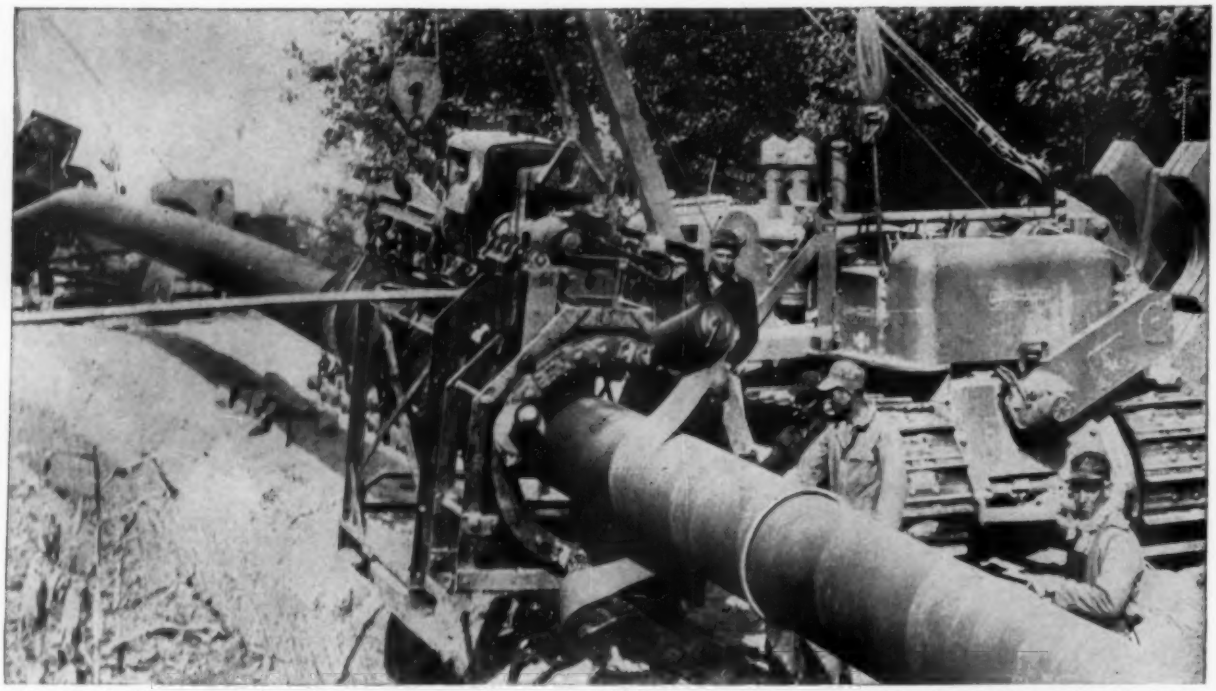
11. Permanently protected pipe awaits delivery to the job.

Specify Hill, Hubbell wrapped pipe on your next job

HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3091 MAYFIELD ROAD, CLEVELAND 18, OHIO





BIG 22-inch Pipe protected against corrosion . . . The pipeline laid by the American-Louisiana Pipe Line Company from Defiance, Ohio, to Bridgman, Michigan, extends 122 miles through rugged terrain, under rivers and beneath railroads and highways. It is completely protected against virtually all forms of corrosion by "Polyken" protective coatings, produced by the Kendall Company—Polyken Sales Division—from film made of BAKELITE Polyethylene.

Pipe wrap of BAKELITE Polyethylene

protects 122 miles of 22-inch transmission line

A significant advance in the preservation and maintenance of the vital pipelines of our gas and pipeline industry is the improved technique of using a tape wrapping of film made of BAKELITE Brand Polyethylene.

Now, instead of the more costly and comparatively slower hot coating methods – pre-formed, tough polyethylene tape is mechanically and simply applied right on-the-job. It provides complete protection against moisture and corrosive environments in one operation.

Using high-speed, power-driven equipment, the pipe is cleaned . . . wrapped . . . and then over-wrapped at top speeds . . . up to 25 ft./min.

The protective advantages plus faster, more efficient installation significantly reduces both long and short-run pipe laying costs. For more information about pipeline protection. send the coupon for our new Booklet, or write Dept. VR-128.

Bakelite Company, Dept. VR-128
Division of Union Carbide Corporation
30 E. 42nd Street, New York 17, N. Y.

Gentlemen: Please send me a copy of the new Polyethylene Pipe Wrap Booklet.

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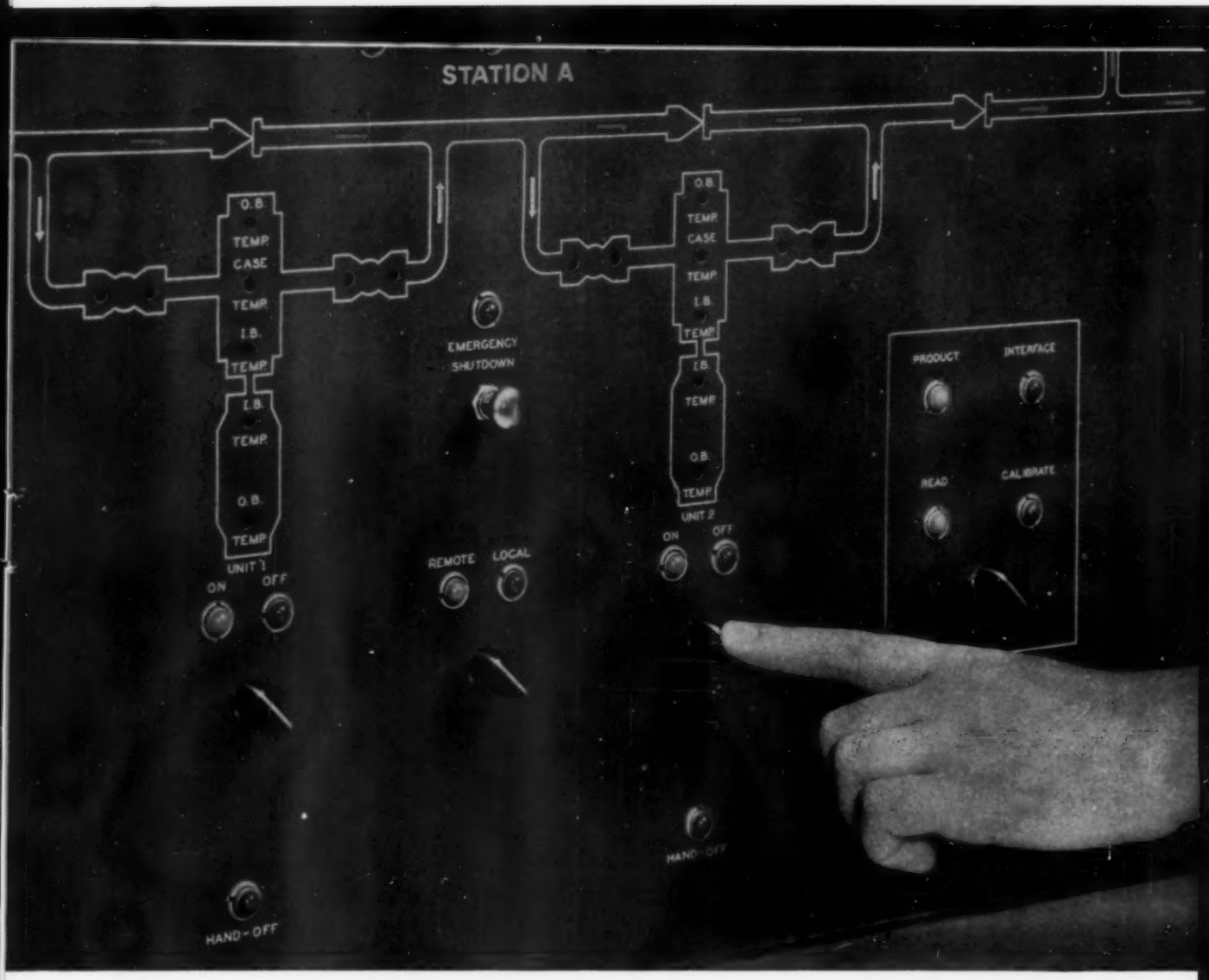

How to push a million gallons of oil from Texas to Chicago—*with one finger!*

A DISPATCHER, sitting at a control console in a central dispatching office, pushes a button—and Centralized Transport Control by Union Switch & Signal does the rest. Hundreds of miles away, a remotely controlled pump hums into action, giving the flowing oil the boost it needs. This is but one of many pumps, located in stations along the entire length of the pipeline, which are all controlled from the console.

On the control console, lighted diagrams tell the dispatcher exactly what is taking place at each pumping station along the line—which pumps are on the line, which valves are open. He can also obtain the temperature and pressures of the moving oil.

The dispatcher receives up-to-the-minute information constantly and automatically. He knows at all times what is happening throughout the entire system. He has fingertip control of all the pumps and valves that enable him to deliver oil at its destination in the most efficient and economical manner.

In the field of push-button science, Union Switch & Signal's record of achievement has been outstanding. In addition to control and communications equipment for pipelines, railways, subways, steel mills, and the mining industry, we have also designed and constructed electronic flight simulators, missile launchers, and air traffic control equipment.

We would welcome the opportunity to put our engineering knowledge and complete manufacturing facilities to work for you.

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DIVISION OF WESTINGHOUSE AIR BRAKE COMPANY
PITTSBURGH 18, PENNSYLVANIA

MATCHLESS STEAM HOSE

"U. S. Matchless #5 does 5 different jobs,"

says refinery division superintendent

"It always passes our strictest lab tests."

A mechanical division superintendent of a leading Midwestern refinery says:

"U.S. Matchless Steam Hose always passes our central maintenance department tests, and we've always had good experience with it. The neoprene cover is oil-resistant. The hose is highly flexible and light in weight. Asbestos ply, under the cover, conserves heat. Wire braid preserves static ground."

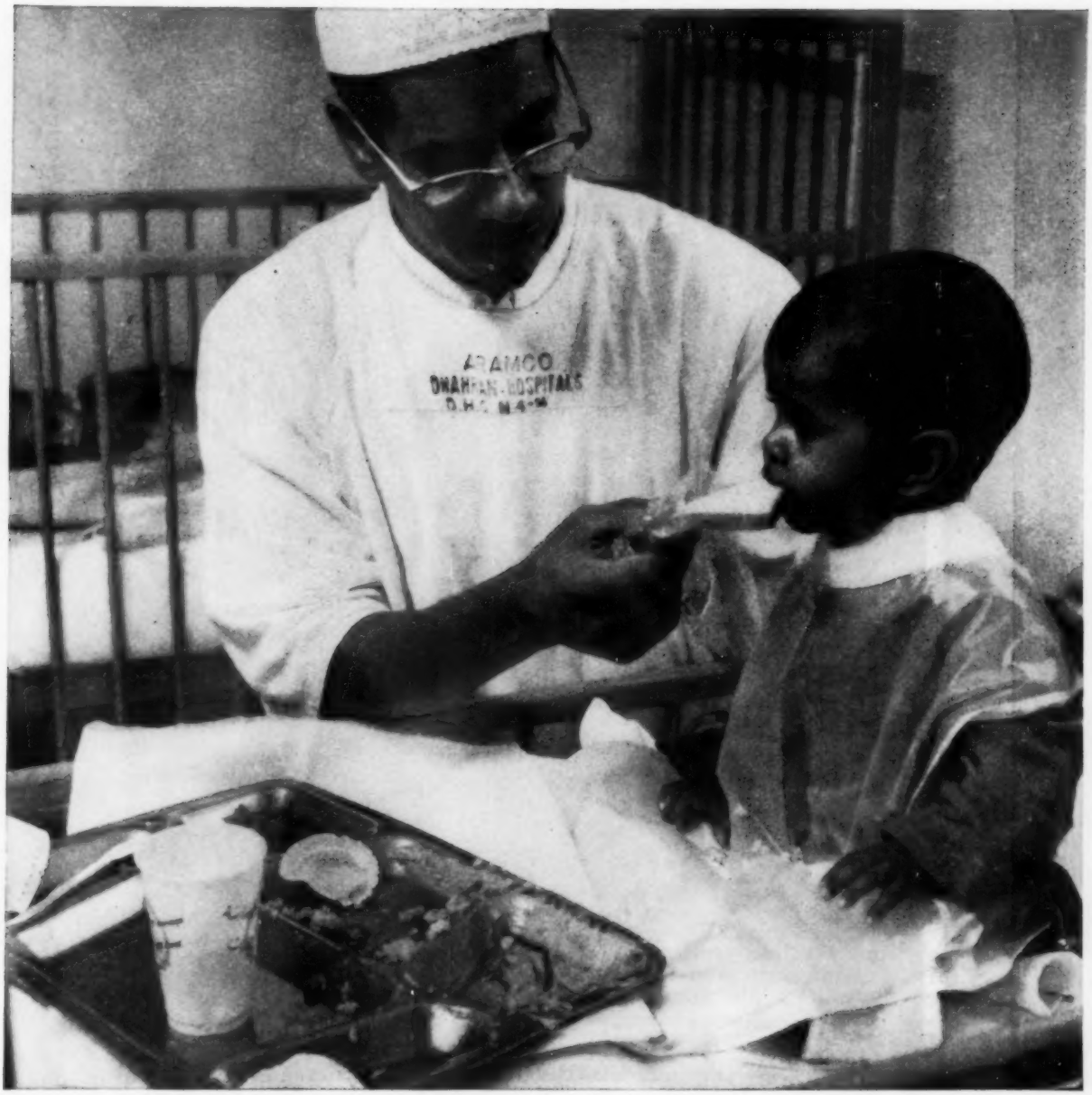
This great "U.S." hose is serving many industries in many ways. It is obtainable at selected "U.S." distributors, at any of the 28 "U.S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

Uses in refinery for U.S. Matchless® #5 Hose:

- As a firefighting hose, for safety-checking atop the 235-ft. cracking unit (see picture above).
- In propane tank, to thaw bottom of gauge glass in cold weather (see inset picture above).
- In pump room of cracking unit, as a steaming line to get gas traces out of the unit.
- On propane transfer line, to prevent orifice from freezing in cold weather.
- Enables construction crews to run temporary steam lines more cheaply and quickly than using pipe.

Mechanical Goods Division

United States Rubber



"Every major decision that an investor makes is a bet on the future. And that involves trust and good faith. Businessmen must have assurance that ground rules are not going to be changed halfway through the game. American capital wants no preferred position, no advantage over the nationals of the host country. What is good for the people of the host country is good for the American investor."

—Eugene Holman, Chairman of the Board, Standard Oil Company (New Jersey)

Esso 75 YEARS

producing energy for an abundant life

STANDARD OIL COMPANY (NEW JERSEY)

AND AFFILIATED COMPANIES

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The "men behind the pipe" at Wheatland insist on *perfection to the last detail*. This perfection includes a trained sales organization . . . schooled to cope with any problem . . . and, with sound ideas that help you promote *your* sales, and . . .

- **Skilled, experienced craftsmen**
- **Meticulous inspections from start of fabrication to the finished product**
- **Strict supervision of all phases of production**
- **Rigid pressure-testing**
- **A reputation for quality built by the caliber of Wheatland Distributors**
- **The Wheatland Yearmark . . . last detail of perfection**

For information about Black or Galvanized Steel Pipe, contact

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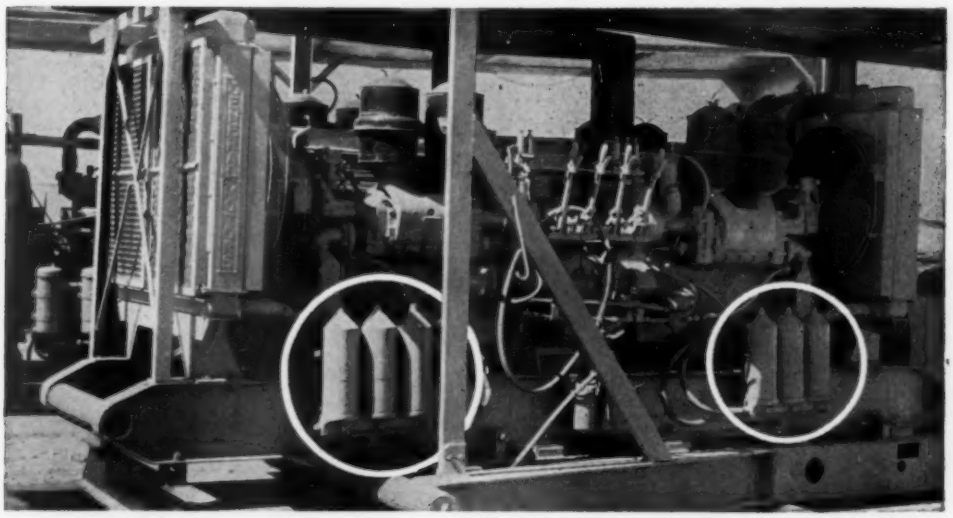
WINSLOW
Full-Flow
FILTERS

Case History Report No. 37 Shows Why Engines
Protected by WINSLOW FILTERS Last Longer



LUBE OIL KEPT CLEAN A MONTH INSTEAD OF A WEEK
with Winslow CP Filters*

Porter-Loughlin Company of Odessa, Texas, one of the largest Texas oil drilling companies, operates many drill rigs. Power for some electric generators is supplied by a quad installation of four 6-71 GM engines. The engines run 24 hours a day—a real tough test on lube oil—on filters and on engines.

With original filter equipment, oil and element changes were made every week. Since the installation of WINSLOW B-74 Full-Flow Filters, with CP* elements, oil and elements are changed only once a month or after 720 operating hours.

That's important in operating costs, and other big savings are longer engine life and lower maintenance cost, with the use of Winslow Filters. Ask about the application of modern CP* filters for all your powered equipment.

CP* FILTRATION

Winslow patented CP* (Controlled Pressure) elements are designed to continuously self-adjust the pressure within the filter and allow for a full stream of filtered oil without opening by-pass valves. This is accomplished through the dual flow capacity, with two types of material in the same element.

**CP is fully protected by patents and trademarks*

WINSLOW ENGINEERING & MANUFACTURING COMPANY
4069 Hollis Street, Oakland, California

W-2593-A

Behind Man's Conquest of the Skies . . .
a Master's Touch in Oil

"Flying Saucer"—experimental military craft today —forerunner of your cloud car of tomorrow . . .

First flight in a heavier-than-air machine—the Wright brothers at Kitty Hawk . . .

First plane over the North Pole, first plane over the South Pole—Admiral Byrd's . . .

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Coast-to-coast propeller plane speed record . . .

All have one thing in common—SOCONY MOBIL'S *master touch* in lubrication.

Good reason! When firsts are in the making—when records are at stake—when schedules must be met —the leaders in aviation look to SOCONY MOBIL.

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Wherever there's progress in motion—in your car, your plane, your farm, your factory, your boat, your home—*you, too, can look to the leader for lubrication.*

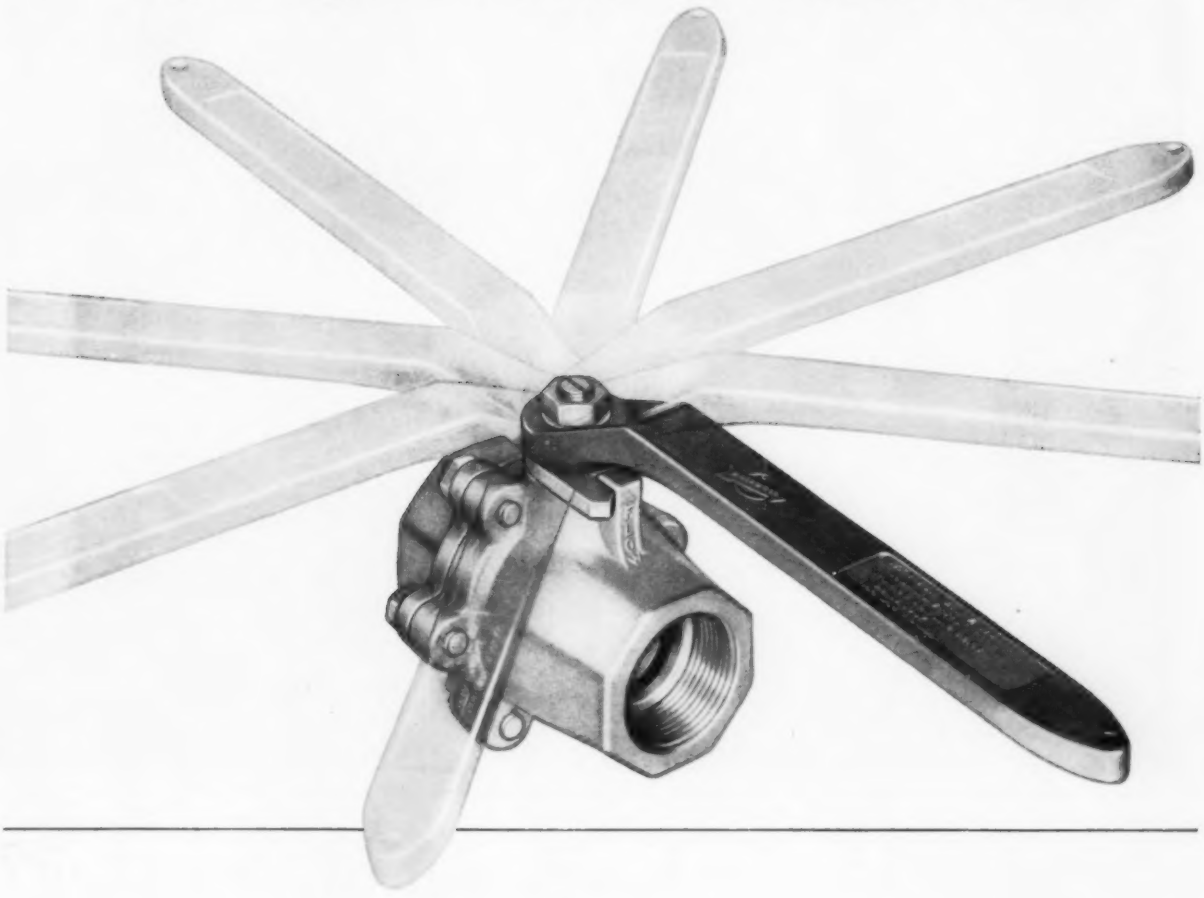
SOCONY MOBIL OIL COMPANY, INC.

LEADER IN LUBRICATION FOR 91 YEARS

Affiliates: General Petroleum Corporation, Magnolia Petroleum Company

New Rockwood Forged Ball Valves

8 Ways Easier to Handle!



New Rockwood Ball Valves are made of forged brass for greater tensile strength and safety. You're assured of Full, Round Flow and fast, efficient operation and less friction loss too.

The handle of the new Rockwood Forged Ball Valve can be positioned in 8 different ways *giving you greater convenience.* The ¼ turn opens and closes the valve — *giving you Full, Round Flow, efficient operation, less friction.* The pressure of fluid in the Rockwood Forged Ball Valve automatically positions the ball against the synthetic rubber seat — *giving you a leakproof seal.* The forged brass ball in the Rockwood Forged Valve is chrome-plated to stand up under abrasion, pitting, scratching — *giving you trouble-free service.*

The new Rockwood Forged Ball Valve comes in pipe sizes from ⅜" to 2". Tested and listed by Underwriters' Laboratories, Inc. Mail the coupon now for complete specifications and information.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

ROCKWOOD

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Worcester 5, Mass.

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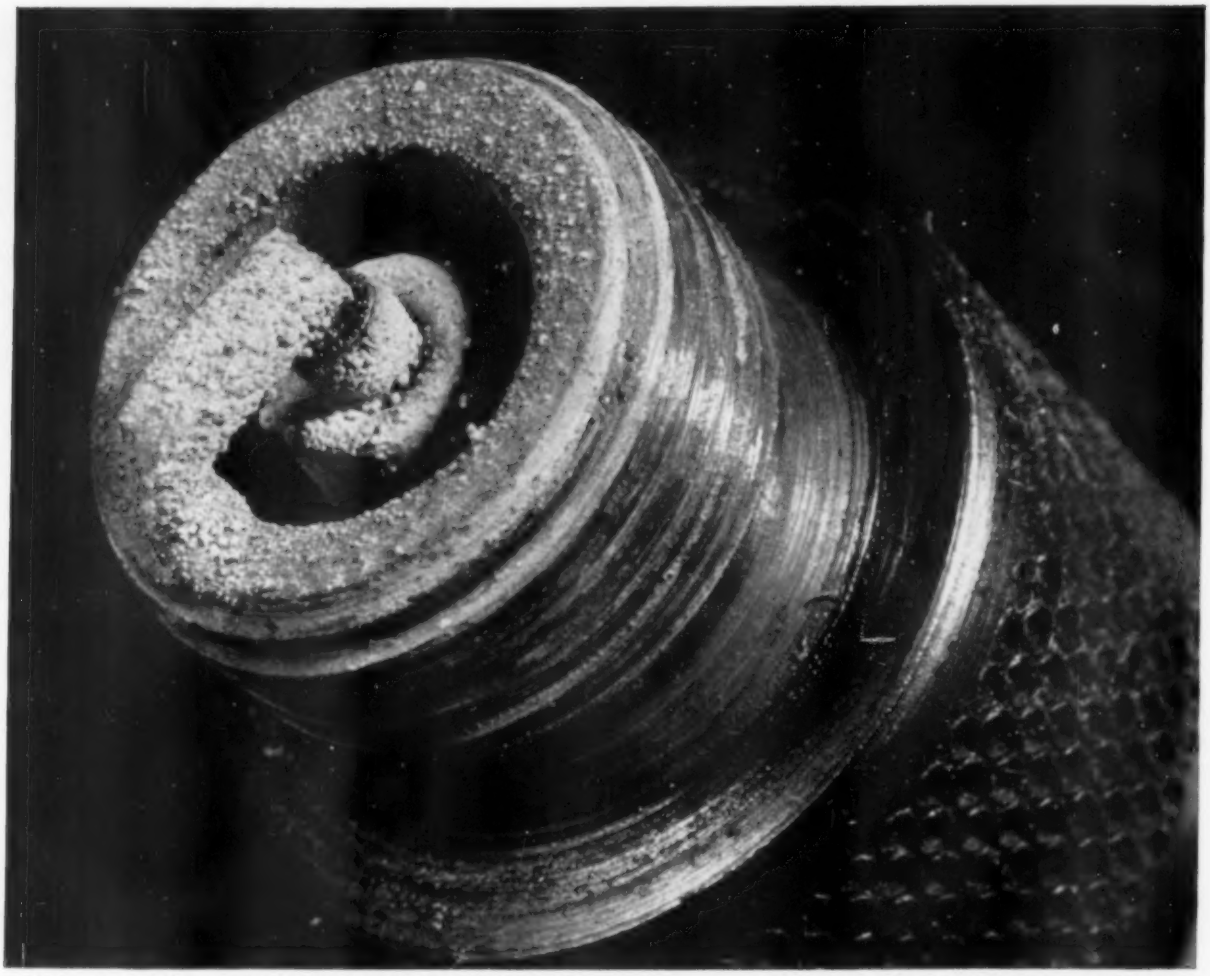
Title.....

Company.....

Street.....

City.....

Zone ...State.....



This unretouched photograph, taken by Edmund F. Hawes, UOP Staff Photographer, was awarded First Prize in the 1956 ASTM Photographic Exhibit.

What took the spark out of this plug?

Whatever may foul up the spark plugs of your car's engine, you can be pretty sure these days it isn't the gasoline. For most refiners are taking the utmost precautions to make sure that the motor fuels they produce burn clean, quick and with the full power needed for today's high compression, high-speed engines. In our business of developing processes for the manufacture of motor fuel we also never take our eye off the performance of the end product. We are constantly concerned with motor fuels made by UOP processes—to help guard against plug fouling and to maintain all the high performance characteristics demanded by modern engines. We believe that in this way we can make an important contribution to the refiner's marketing and manufacturing well-being. Refiners, everywhere in the free world, look to UOP for the processes and service so important to the production of cleaner, more efficient motor fuels.

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That's one reason why the OXWELD W-17 is *still* preferred by those who know welding apparatus. And that's why more W-17's are serving American industry today than any other welding blowpipe.

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... do it today!

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DIVISION OF UNION CARBIDE CORPORATION

30 East 42nd Street, New York 17, N. Y.

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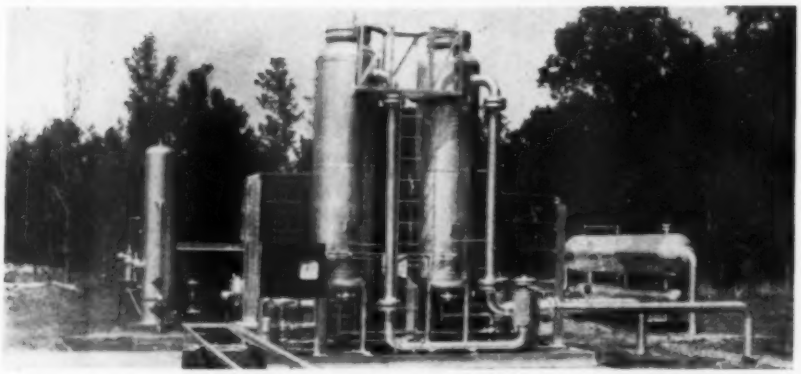
SHOWCASE...

NEW EQUIPMENT



Adsorption Unit Recovers Hydrocarbons

Here's a new processing unit for recovering raw gasoline from natural-gas streams. Trade named Dryex, it's a fully automatic packaged adsorption unit designed primarily for use on relatively small and lean natural-gas streams, according to the manufacturer. But it also can be used effectively and economically on large, rich gas flows, the maker says. The standard models are designed to operate under average natural-gas-pipeline conditions.

The unit consists primarily of two vertical adsorption towers, a vessel in which recovered liquids are stored, a heat exchanger, direct-fired gas heater, piping, three-way valves, and gas pump. The three-way valves direct the main stream flow through first one and then the other tower while two of the other valves send regenerative gas through the alternate tower. **Write or call: Delta Tank Mfg. Co., Baton Rouge, La., for details on Dryex units.**

●

Shaft-Mounted Drive Offers Ratio of 24:1

A ratio of 24:1 (or 20:1 in two smaller sizes.) is now available in this new Falk all-steel double-reduction shaft-mounted drive. The outside dimensions and torque rating remain the same. Advantages cited for the higher-ratio unit include: (1) the use of smaller sheaves to obtain a given output speed, and (2) a saving in motor cost when, because of the lower output speed, a 1,750 r.p.m. motor can be used instead of a slower-speed motor.

The unit is available for horizontal and vertical applications in ½ to 30-hp. ranges with output speeds as low as 5 r.p.m. **Write or call: Falk Corp., Dept. 255, 3001 West Canal Street, Milwaukee 1, Wis., for Bulletin 7101.**

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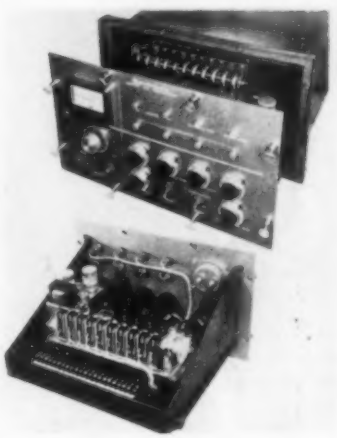

Chromatograph Analyzes Four Stream Components

Continuous analysis of as many of four components of a specific gas stream can be done with this new Beckman Series 120A industrial gas-chromatograph control unit and analyzer section, the maker reports. It features two distinct instruments which can be placed as much as 1,500 ft. apart and still maintain accurate measuring and recording.

The chromatograph provides simplified control and features visual and permanent recorder readout, an accuracy of ± 1 per cent, a locking door, an integrated test circuit to facilitate periodic maintenance without disassembly, and automatic or manual operation.

Measuring 11⅜ by 19⅛ by 15⅛ in. and weighing 60 lb., the chromatograph records measurements made by the Beckman Series A analyzer for use in

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Described in OIL AND GAS JOURNAL - Issue of September 16, 1957

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CITY.....STATE.....

DATE.....

Leading firms specify **SOLA-FLEX®**

These 120 Sola-Flex Joints go into new ALCOA plant

MORE AND MORE LEADING FIRMS specify Sola-Flex industrial expansion joints to help solve difficult pressure and temperature problems. This shipment of bellows will be used in Aluminum Company of America's smelting plant at Point Comfort, Texas—and other volume orders are scheduled for petroleum, chemical, power and many other industries requiring durable, economical expansion assemblies.

Solar manufactures the most comprehensive line of bellows and expansion joints in the world. Types include convoluted, U-span, rectangular and custom-built joints for specific problems. Stainless steel and heat-resistant alloy bellows have been built for service from −320 F to 2000 F. And they have been supplied in sizes ranging from ½ inch to the world's largest—28 feet in diameter.

Hot or cold, large or small, high pressure or low—no matter what your particular piping need, experienced Solar engineers can recommend exactly the right expansion joint for you. Write today for the latest Sola-Flex catalog. Dept. D-84, Solar Aircraft Company, San Diego 12, California.

SOLAR AIRCRAFT COMPANY — SAN DIEGO, DES MOINES

DESIGNERS, DEVELOPERS AND MANUFACTURERS OF GAS TURBINES EXPANSION JOINTS • CONTROLS • AIRCRAFT AND MISSILE COMPONENTS

SHOWCASE . . .

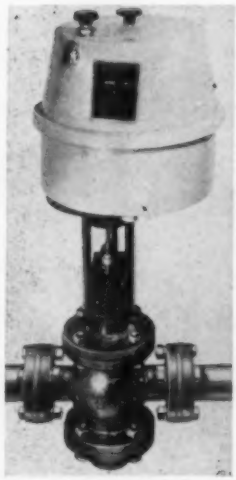
New Equipment

Class I, Group D locations. A single-action five-way linear sample-injection valve which duplicates the action of five conventional two-way valves is the heart of the gas-handling system. **Write or call: Process Intsruments Div., Beckman Instruments, Inc., 2500 Fullerton Road, Fullerton, Calif., for details on Model 120A chromatograph.**

Electro-Hydraulic Valve Actuator Operated by Variety of Signals

Signals supplied by commercially available controllers, remote positioning devices, or directly from a measuring element will operate this new Askania valve actuator, the company reports. The self-contained unit is designed for valves with a full stroke of ½ to 1½ in. requiring less than 200 lb. of thrust.

The standard signal range is 1 to 5 or 4 to 8 milliamperes d.c. For a.c. signals, an internal rectifier is supplied with the unit. Electrical connections comprise only two signal wires and two wires for the power supply. **Write or call: Askania Regulator Co., 240 East Ontario Street, Chicago 11, Ill., for details on valve actuator.**



ROCKFORD POWER TAKE-OFF SERVICE

These ROCKFORD DISTRIBUTORS and DEALERS carry a stock of clutches, power take-offs and replacement parts to insure ROCKFORD clutch users prompt delivery and service.

Lightbourn Equipment Company, Dallas 2, Texas
Rig Service Company, Houston, Texas
Mike Carter Engine Works, Wichita Falls, Texas
Carter Engine & Equipment Company, Abilene, Texas
Engine Service & Supply Company, Odessa, Texas
Oil Field Motor Service Company, Alice, Texas
Diesel Power Company, Oklahoma City, Oklahoma
Diesel Power Company, Tulsa, Oklahoma
United Engine Company, Shreveport, Louisiana
United Engine Company, Alexandria, Louisiana
Elms Equipment Company, Lubbock, Texas
Atlas Auto Parts & Grinding Company, Louisville, Kentucky
Auto Gear & Parts Company, Philadelphia 40, Pennsylvania
Brake & Clutch Service Company, Denver 2, Colorado
Auto Clutch & Parts Service, Inc., Chicago, Illinois
Blalock Machinery & Equipment Company, Atlanta, Georgia
Continental Sales & Service Company, Los Angeles 58, California
General Machine Parts Company, New York 51, New York
The Credle Equipment Company, Utica, New York
Genuine Motor Parts of Pennsylvania, Inc., Pittsburgh 13, Pennsylvania
Highway & Industrial Equipment Company, Inc., Raleigh, North Carolina
M. D. Moody & Sons, Inc., Jacksonville 7, Florida
Wepco Equipment Company, Cleveland 5, Ohio
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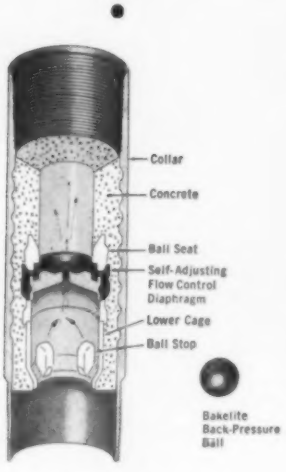
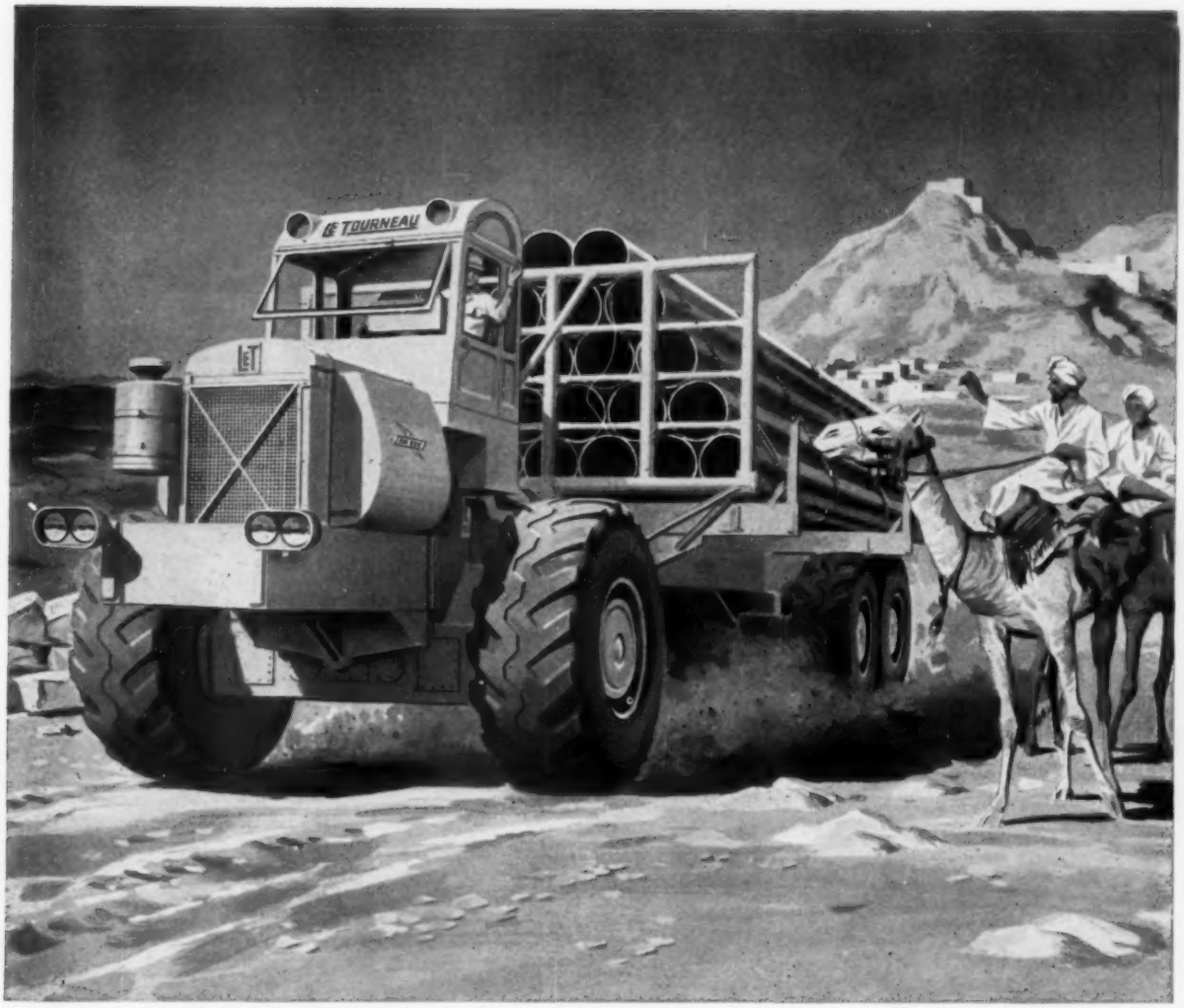


Casing Fill-up Collar Acts as Back Pressure Valve

In addition to filling casing automatically from the bottom as it is being run, this new Baker circulating Flexi-flow fill-up collar permits circulation to be carried on at any time while running in the casing, according to the maker. Called Product 161-D M&F, the collar is said to eliminate high-pressure surges that might otherwise break down a weak zone or mud off a producing zone. It contains a back pressure valve that reportedly can be brought into action for cementing by merely pumping a Bakelite ball down the casing to the collar.

A self-adjusting flow-control diaphragm is used in the collar to automatically reduce the pressure surges and provide controlled filling of the casing. When casing is lowered in the well, in-



60,000 LB. PAYLOAD OVER TRACKLESS WASTES

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It takes traction to move 30 tons cross country, and that's what the LeTourneau Transporter delivers. Infinitely controllable Electric Power is supplied to each wheel through its own motor and gear reduction. Extra-wide, low-pressure tires provide a big compaction area . . . stay on top of soft ground and exploit every ounce of tractive power available from the diesel-electric power plant.

The combination of big tires and individual wheel drive moves heavy cargo economically and efficiently in areas where other types of vehicles can't do the job. Other features: No-wear, electric braking . . . Positive, switch-controlled, powered steering . . . Automatic proportioning of power to wheels with best traction.

If your problem is hauling heavy cargo cross country, a LeTourneau Transporter may be the answer. Send us a statement of your requirements and a description of the terrain you must cross. A Transporter will be recommended only after an analysis indicates that it may be profitably used.

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creased pressure from below causes a small hole in the center of the diaphragm to open up wider to relieve the pressure from below by permitting a large volume of fluid to enter.

When downward movement of the casing is slowed down, pressure from below is reduced and the hole in the diaphragm contracts to normal size. **Write or call: Baker Oil Tools, Inc., Box 2274 Terminal Annex, Los Angeles 54, Calif., for details on Flexiflow fill-up collar.**

Aluminum-Coated Steel Protects Vessels

The accompanying illustration indicates how aluminized steel (Type 2) can be used on reformer reactors, cracking-unit catalyst disengagers, and other high-temperature vessels to shield them from driving winds and rain and to provide insulation by reflecting radiant heat.

According to the maker, the aluminum-coated steel is especially suited as a protective covering for such vessels because of its combination of strength and corrosion resistance. **Write or call:**

Armco Steel Corp., Middletown, Ohio, for details on Type 2 aluminum-coated steel.

•

Gasoline Sweetener Works Faster

A selective catalyst is employed in this new U.O.P. sweetening inhibitor to promote rapid oxidation of sulfur compounds in gasoline. Called U.O.P. 5-S, the formulation, the company said, has been proved in laboratory tests and commercial usage to be even better than previous inhibitors for applications where inhibitor sweetening is the controlling factor in the choice of inhibitor used.

Retaining the potency of water-insolubility characteristics of U.O.P. 5 inhibitor, the additive accomplishes sweetening in one-fourth to three-fourths the time ordinarily required with U.O.P. 5, depending upon the mercaptan content and other conditions. The inhibitor, according to the company, makes it possible to readily sweeten many gasolines heretofore considered impractical for inhibitor sweetening. **Write or call: Universal Oil Products Co., 30 Algonquin Road, Des Plaines, Ill., for details on U.O.P. 5-S.**

•

Check Valve Developed For ½ Through 2-In. Pipe

The body and components of this new Walworth all-plastic lift-check valve are made of normal-impact rigid polyvinyl chloride to provide high corrosion resistance to alkalis, acids, inorganic salt solutions, and other corrosive flow material, the company re-

Dense homogeneous structure with no moisture absorption

No practical current density limitation

Predictable low consumption rate

Virtually chemically and galvanically inert

Electrically stable with good conductivity

Everything points to

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Impressed Current

DURCO ANODES

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INTENT CRAFTSMEN

Quality craftsmanship is amply demonstrated by Graver skills with automatic aluminum welding equal to ASME X-ray standards. Graver's advanced welding techniques are among the reasons Graver is called upon regularly to fabricate aluminum, alloys and carbon steel into a variety of shop-built and field-erected pressure vessels and storage tanks. It will pay you to inquire about how Graver craftsmanship and experience can be valuable to you, too.

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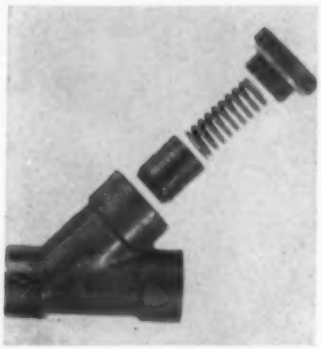
SHOWCASE . . .

New Equipment



ports. A durable PVC spring positions the disk to assure quick and complete shutoff.

The check valve reportedly operates successfully at pressures up to 150 psi. at 75° F. The check valve, easily handled and installed, is available for pipe sizes of ½ through 2 in. It comes with threaded, solvent-weld socket or flanged ends. **Write or call: Walworth Co., 60 East Forty-second Street, New York, N. Y., for details on all-plastic lift-check valve.**

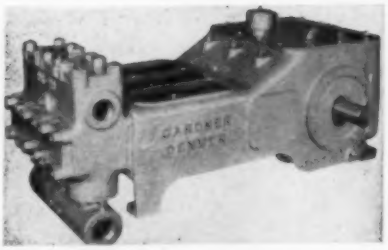
Bottom-Hole Pump Handles Concentric Strings

This new bottom-hole rodless hydraulic pump is designed for either concentric or parallel-string free pumping. It is operated by fluid or power oil from a triplex pump on the surface.

The downhole pump unit is inserted and pumped down to its operating position on the bottom of the well or returned to the surface by the turning of valves which change the flow of the power oil.

The pump works equally well in straight, slanted, crooked, shallow, or deep wells, the maker claims. It's constructed essentially the same as the conventional bottom-hole rod pump except that the unit has a positive mechanism to reverse the flow of power fluid.

In marginal areas or where curtailment is in effect, a number of wells can be powered by the same unit. And large groups of wells operating under curtailment can be pumped intermittently, thus eliminating costly units used only part of the time, the maker points out. **Write or call: Sargent Engineering Corp., 2533 East 56th Street, Huntington Park, Calif., for details on rodless pump.**



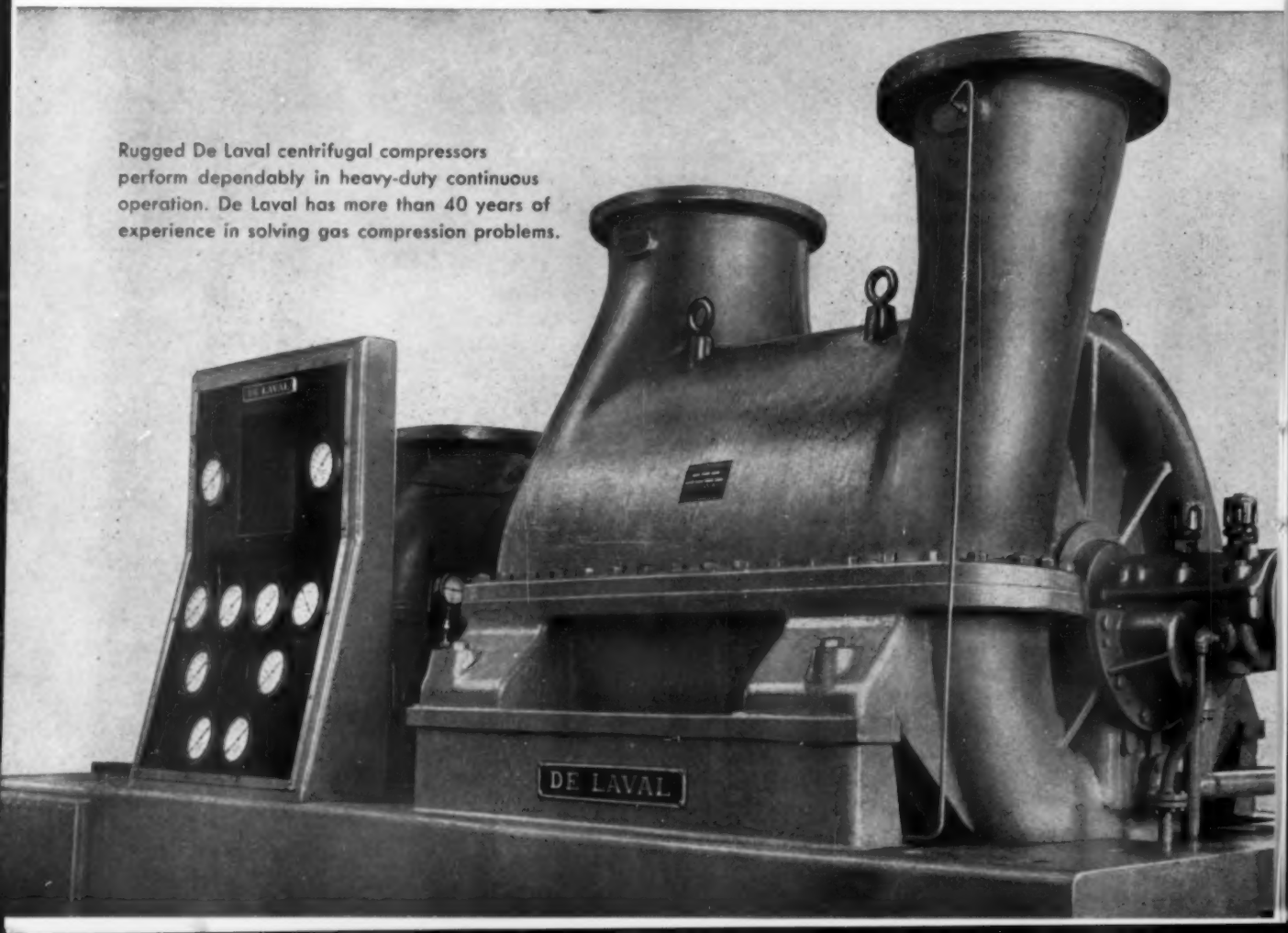
Triplex Plunger Pump Offers Seven Models

Seven models of this new pump for water-flood and salt-water disposal service are available, permitting the right volume-pressure combination to be selected as required by field conditions, according to the maker.

Called the PG-3, the pump is a triplex plunger type. Maximum ratings in continuous service are 30 b.hp. and 500 bbl. per day at 3,050 psi. and 1,600 bbl. per day at 940 psi. With an aluminum-bronze fluid end, the pump weighs 1,215 lb.

Its features include a one-piece fluid end, individually accessible valves, an eccentric drive, and one-piece connecting rods. **Write or call: Gardner-Denver Co., Quincy, Ill., for details on PG-3 pump.**

Rugged De Laval centrifugal compressors perform dependably in heavy-duty continuous operation. De Laval has more than 40 years of experience in solving gas compression problems.



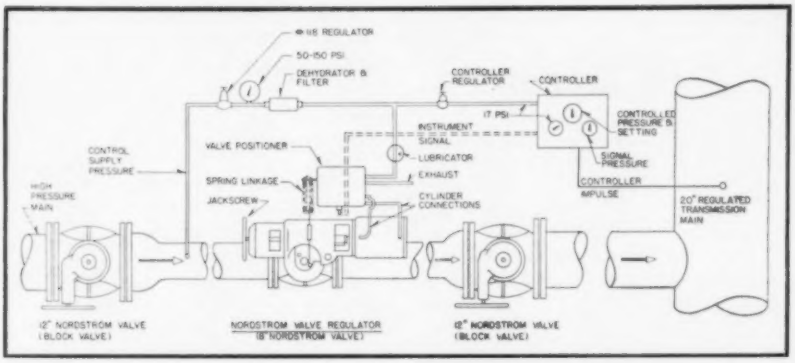
Steel Gate Valves Come in Three Types

The new lines of Crane 600 Class steel gate valves for oil and gas service are now available. They include: (1) a single-disk conduit type of pipeline valve, (2) a double-disk parallel-seat pipeline valve, and (3) a smaller gate valve for general service.

Both pipeline valve designs are suitable for service with crude oil, refined petroleum products, and gas at atmospheric temperatures, according to company officials.

The steel conduit valve comes in sizes from 2 through 30 in. Its design permits flow in either direction. And it permits easy passage of a scraper, creates no turbulence and has no pockets to accumulate dirt, the maker claims.

The double-disk pipeline gate valve is available with flanged or butt-welding ends. Both the conduit and double disk pipeline valves feature a plastic packing injector protected by two ball-check valves. Both designs may be back seated, permitting replacement of V-rings while in service. **Write or call: Crane Co., 836 South Michigan Avenue, Chicago 5, Ill., for details on Class 600 steel gate valves.**



Plug Valve Regulator Controls Pipelines

High-pressure gas regulation with low pressure loss is achieved by this new pneumatically controlled cylinder-operated lubricated plug-valve regulator, the maker reports. While the valve regulator is effective on such services as intermediate pressure control, back-pressure relief, and widely varying flows, it is designed primarily for such large-volume applications as high-pressure transmission lines, storage, and town-border stations.

It consists primarily of a cylinder-operated valve with a pneumatic pressure controller and valve positioner. An increase or decrease of the downstream pressure causes a change in the output of the pressure controller. This, in turn, causes the valve positioner to apply pneumatic power to the cylinder operator, repositioning the valve and controlling the downstream pressure at the set point.

The valve-regulator can be set up for either fail open (direct-acting controller) or fail closed (reverse-acting controller) operation. **Write or call: Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, Pa., for details on plug-valve regulator.**

DE LAVAL
CENTRIFUGAL
COMPRESSOR

helps boost cat-cracker capacity at Shell Oil of Canada, Limited

To obtain extra capacity, the Montreal East refinery of the Shell Oil Company of Canada, Limited decided to rebuild its cat-cracker. Since the modernized cracking unit required a greater volume of air, Shell of Canada selected a dependable De Laval centrifugal compressor handling 16,400 cfm.

This compressor operates at an inlet pressure of 14.3 psia and a discharge pressure of 42.8 psia. The power required is 1860 bhp with the compressor operating at 5400 rpm.

The Shell Oil Company of Canada, Limited is another refinery which has chosen De Laval compressors for heavy-duty continuous service. Whether you need to handle light or heavy gases at high or low pressures in catalytic cracking, reforming, alkylation, coking or any similar service, it pays to look to De Laval.

Send for Bulletin 0504

DE LAVAL *Centrifugal Compressors*

DE LAVAL STEAM TURBINE COMPANY

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OL575

SHOWCASE . . .

New Literature

Valve Catalog. Complete specifications and illustrations of Darling gate and check valves are presented in new 244-page Catalog 57. The valves are available in a broad range of types, sizes, and constructions. In addition to covering the company's latest developments, such as automatic self-sealing conduit gate valves and special-purpose corrosion-resistant valves, the catalog includes extensive engineering data (36 pages), application tips, valve-accessories information, and reference data on materials, specifications, and standards. **Write or call: Darling Valve & Mfgr. Co., Williamsport, Pa., for Catalog 57.**

●

New Corrosion Preventive for Pipelines, Kontol 77, is the subject of a new six-page Tretolite Co. brochure. It discusses basic facts about the new product. And it details primary advantages that are said to help pay for the cost of using the products. These include reduced maintenance, freedom from product contamination, increased throughput, improved "C" factor, and extended life for such auxiliary equipment as meters, valves, screens, and pumps. Useful information is presented in a chart of treating ratios and equivalent costs, as well as in a discussion of how much of the product is required under such varying conditions as new or clean lines, moderately clean lines, and dirty lines. **Write or call: Tretolite Co., 369 Marshall Ave., St. Louis 19, Mo., for brochure on Kontol 77.**

●

Patented Concrete Weights for Pipeline Use and concrete weighting material are the subject of this new 12-page brochure. Tables give the weight of bare pipe and pipe displacement. The brochure includes illustrations of the maker's facilities for concrete weighting of all types of pipelines and a brief resume of the company's activities. **Write or call: Anchor-Wate, P. O. Box 856, Almeda, Tex., for brochure on concrete-pipe weights.**

●

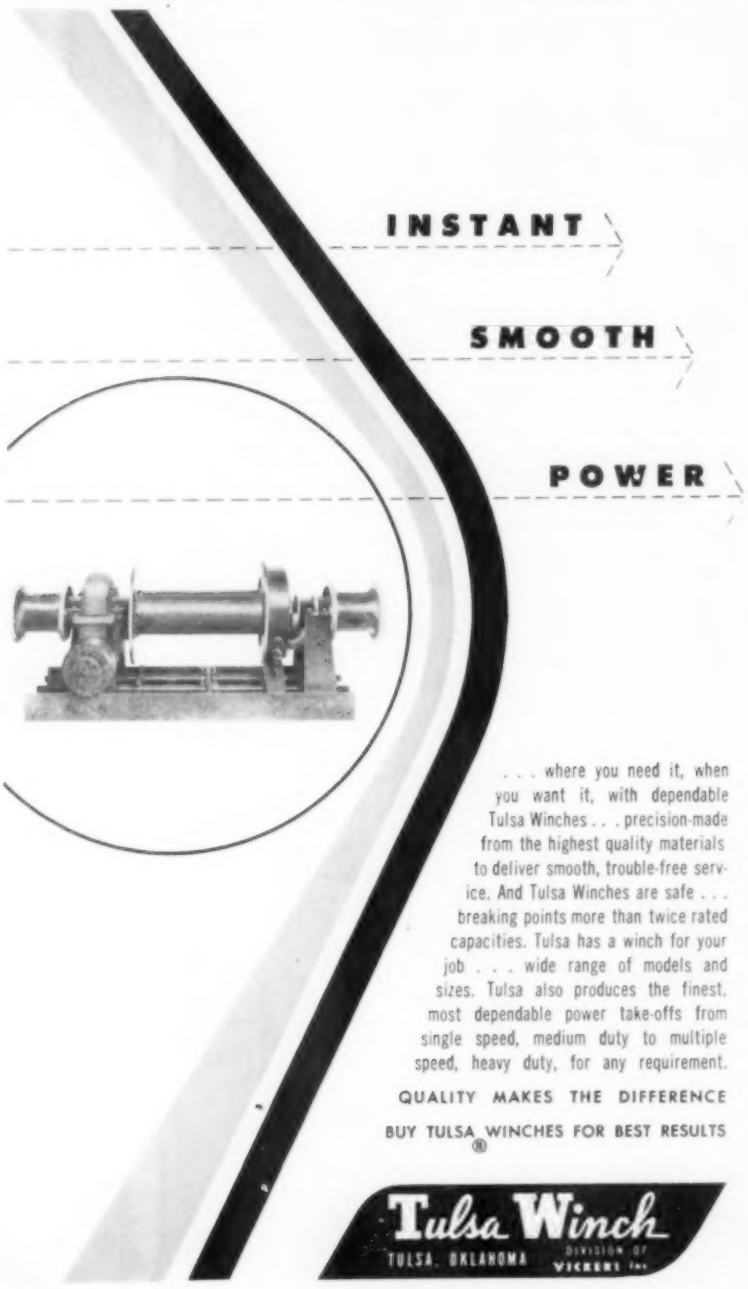
Slush Pump Sheaves and V-Belts designed specifically for drilling applications are the subject of 12-page Bulletin 1400-B22P. The new bulletin's charts and tables list horsepower ratings and standardized dimensions of slush-pump sheaves and V-belts. Describing the features of Worthington GD sheaves for slush-pump service, it pictorially illustrates applications of the sheaves in drilling. A one-page "maintenance clinic" for remedying V-belt-drive trouble spots is cartoon illustrated. **Write or call: Worthington Corp., Oil City, Pa., for Bulletin 1400-B22 P.**

●

Centrifugal Pumps ranging in capacities from 100 to 3,500 g.p.m., pressures to 450 psi., heads to 1,100 ft., and temperatures at 300° F. are featured in new 16-page two-color Form 7062-C. It also incorporates cross-sectional drawings, installation views, selection charts, and dimension tables. This bulletin fully describes the advantages of the IR Class GT pumps. **Write or call: Ingersoll-Rand, 11 Broadway, New York 4, N. Y., for Form 7062-C.**

●

Services for the Oil Industry available from Dowell Incorporated are set forth in a new 20-page brochure. Indexed for reader convenience, the brochure explains the company's services and products for increasing oil and gas production and plant throughput. The services described include nine fracturing services designed to improve the producing characteristics of wells by hydraulic or chemical-hydraulic means, as well as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. . . where you need it, when you want it, with dependable Tulsa Winches . . . precision-made from the highest quality materials to deliver smooth, trouble-free service. And Tulsa Winches are safe . . . breaking points more than twice rated capacities. Tulsa has a winch for your job . . . wide range of models and sizes. Tulsa also produces the finest, most dependable power take-offs from single speed, medium duty to multiple speed, heavy duty, for any requirement.
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Tulsa Winch
TULSA, OKLAHOMA
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2 ways to cut your tank costs

Because Columbian Bolted Steel Tanks "fit up" better and faster, they often save substantial time-costs in tank erection. And because they are equipped with the latest in modern sealing methods, these naturally tighter tanks always cost less over the years of service.

Time lost in getting your tank to the site and into service can be costly too. You can cut this time by calling your nearest Columbian distributor, listed below. He'll have the size tank you want quickly available, where and when you want it.

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MASTER-CRAFTED BY COLUMBIAN SINCE 1893

2. Call your nearest COLUMBIAN Distributor!

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Westex Tank Co.
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Panhandle Steel Products Co.
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STEEL—Master-crafted by Columbian . . . First for Lasting Strength

Guiberson
Casing Swab
with "GW" Cups

FLEXIBILITY

that means every-drop casing swabbing!

GUIBERSON "GW" CUPS

**hug casing wall—
automatic seal,
controlled pipe contact**

- Unequalled in rough or mixed casing strings
- Stout, flexible lip brings up every drop
- Won't down-swab or hang on casing collars
- Perfect for unloading shallow wells
- Abrasion resistant compound — takes up own wear
- Performs better — lasts longer — costs no more
- Interchangeable on the Guiberson Casing Swab

Guiberson Swab with "GW"
and "K" cups offers greatest
size range on the market.

Better Be Safe Than Sorry!

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919
DALLAS, TEXAS
U. S. A.

Sold by
Oil Field Supply Stores
Everywhere

acidizing and cementing services. The brochure also describes the company's electric-pilot services designed to help plan and perform well completions and workovers and its chemical-cleaning service designed to remove scale and sludge deposits from industrial equipment, tanks, and piping systems. **Write or call: Dowell Incorporated, Box 536, Tulsa 1, Okla., for brochure listing oil-industry services.**

●

Directory of Automatic Electrodes and Fluxes for submerged arc welding and hardfacing is included in new Lincoln Publication SB-1354. The eight-page publication covers five electrodes and four hardsurfacing fluxes. Convenient charts list typical properties of weld deposits and provide a guide for flux selection by operating characteristics. **Write or call: Lincoln Electric Co., Cleveland, Ohio, for Publication SB-1354.**

●

Neoprene Data Sheet. The physical and chemical resistances of Neoprene sheet are listed in this new data sheet, Bulletin PC-7. The maker applies the Neoprene linings to tanks, ducts, and other equipment exposed to critical service. **Write or call: Protective Coatings Div., Metalweld, Inc., Scotts Lane and Abbottsford Avenue, Philadelphia 29, Pa., for Bulletin PC-7.**

●

Electric-Plant Applications for Buildings and Vehicles are the subject of Power Points Digest, Vol. 12, No. 4. The 16-page, 2-color booklet illustrates and describes a variety of generating-plant applications where difficult installation and ventilating problems were overcome. It tells how a well-surveying company relies on the electric plants to provide standard a.c. power for mobile well-logging field units. Other mobile applications are also noted. **Write or call: D. W. Onan & Sons, Inc., Minneapolis 14, Minn., for Power Points Digest, Vol. 12, No. 4.**

●

Single-Stage Centrifugal Pumps for process plants are illustrated and explained in new Bulletin 137. The bulletin covers the Pacific SVC pump developed for transfer of hydrocarbons, chemical solutions, acids, and condensates in petroleum refineries, and natural-gasoline and petrochemical plants. This pump is capable of temperatures in excess of 800° F. with a capacity range of 15 to 3,000 g.p.m. at a working pressure of 600 psig., a differential head of 700 ft. and speeds of 4,000 r.p.m. The bulletin gives the pumps' applications, mechanical and hydraulic design, and materials of construction. It also furnishes dimensional drawings and tables and a pump-size-selection chart for estimating only. **Write or call: Pacific Pumps, Inc., 5715 Bickett Street, Huntington Park, Calif., for Bulletin 137.**

●

Dual-Fuel and Spark-Ignition Gas Engines with either six or eight cylinders and ranging in size from 640 to 2,150 hp. are described in new 16-page Bulletin 257. The engines are built as supercharged; supercharged and intercooled; and Supairthermal units. Separate data sheets give the horsepower ratings, outline drawings of the engines, and all dimensions required for preliminary planning. The Supairthermal system is explained and a schematic diagram illustrates its cycle of operation. Photographs and an annotated cross-section view through a power cylinder show the basic design and construction features of the Supairthermal engine's bedplate, main frame, cylinder parts, pistons and valve lever assembly. The various applications of the four-cycle engines are shown by photographs of recent installations throughout the world. **Write or call: Nordberg Mfg. Co., Milwaukee 1, Wis., for Bulletin 257.**

A 9600′ LOADCRAFT 808 TRAILER WITH A 50,000 PAYLOAD . . .

. . . and at less cost than a conventional trailer

This new *LOADCRAFT* 808 Oil Field Float has the ultimate in weight-strength ratio of any trailer available.

It is now priced lower than conventional trailers, and is available for immediate delivery.

The *LOADCRAFT* 808 weighs 9,600, but is rated to carry 50,000 pounds. This is 25% less trailer weight and 20% more payload than other trailers. This means more payload per trip . . . less trips per job. It's built for cross-country, too – with exclusive new *LOADCRAFT* bar-spring tandem.

The trailer is fabricated entirely of special formula 808 steel with a full 18″ deep frame and 9″ outer rail. It is designed for three-point stability in nose loading . . . has oversize rolling tail pipe with self-aligning bushing for rear loading.

Get the complete story on this wonderful new trailer. See your *LOADCRAFT* dealer.

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AUGUSTA, KANSAS

So rugged it's the world's first choice!

Canadian cold or Arabian heat—
the tough TOTCO double recorder is a
little giant when it comes to
withstanding shock, pressure or heat
below ground, or the extremes of
weather above ground. That's why
most oilmen the world over say,
"Be sure you know, use TOTCO!"

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EQUIPMENT MEN . . . in the News

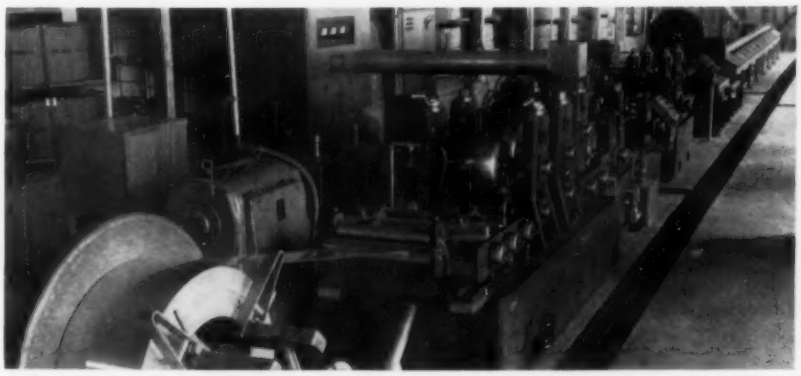
Parkersburg Announces Two New Branches, Promotions

Establishment of two new branches have been announced by C. D. Haehl, Jr., general manager of the production equipment division of Parkersburg Rig & Reel Co. A new branch at Liberal, Kans., will serve the Texas Panhandle, western Oklahoma and southwestern Kansas. J. W. Bower has been named branch manager.

At Farmington, N. M., a branch has been set up under the managership of W. H. Clayton to serve the Four Corners area.

Other personnel transfers and promotions in the production equipment division include the transfer of B. G. McDonald from Odessa to Hobbs where he will be branch manager, succeeding the late W. D. Moore. Others named to be branch managers were T. J. Daniels at Shreveport; J. S. Hunter at Lafayette; B. B. Rister at Corpus Christi; A. F. Kreutzer at Oklahoma City; J. L. Simmons at Great Bend; and B. D. McClellan at Houston.

J. L. Lamp, salesman at Denver, was transferred to Midland.



Race & Race Begins Operation of New Tube Mill

This new, specially designed tube mill has just been put in operation by Race & Race, Inc., of Winter Haven, Fla., manufacturers of Racebilt industrial pipe and Racebilt irrigation pipe. The mill, designed and built for Race & Race by Abbey-Etna Co., utilizes aluminum sheet in rolls to form the tubes, which are continuously welded by a new process. The new mill will produce tubing of all popular sizes.

"Ray Terry" Drilling Barge Goes Into Service

The second shallow-water drilling barge placed in service by Natural Gas & Oil Co. was christened recently at the Bethlehem Shipyard, Beaumont, Tex. Named the "Ray Terry," the new diesel-electric drilling unit is named for the vice president in charge of Natural Gas & Oil Co., a division of Mississippi River Fuel Corp. Measuring 215 ft. in over-all length and costing approximately $1.5 million, the "Ray Terry" is capable of drilling in excess of 20,000 ft.

Six Caterpillar turbocharged D397 diesel engines supply complete power for the vessel's operation. Four of these engines supply power to the mud pumps, draw works, and rotary table. These engines are equipped with General Electric Type GE-752-J1, two-bearing DC drilling generators, which deliver current to electric motors powering the drilling components. The remaining two Cat D397 engines supply power for the barge and are equipped with Caterpillar 350 kw., 240/480-volt, 3-phase, 60-cycle a.c. generators. The air starting system for all main engines is supplied by three Gardner-Denver Model ADR V-type compressors.

Two of the Emsco mud pumps are Model D-1000's, each driven by two General Electric DC motors. In addition, one Emsco Model D-300 power slush pump is unitized with a Caterpillar D337 (Series F) turbocharged diesel engine.

The drilling platform, located amidships and elevated above the superstructure deck, is fitted out with a Lee C. Moore 147-ft. derrick having 30-ft. leg spread, equipped with Regan crown and traveling blocks, and a Byron Jackson 500-ton-capacity Hydroplex hook. The draw works, mounted forward on the drilling floor, is an Ideco E-2500, equipped with a shaft rotary drive assembly to drive the 27½-in. Ideco rotary.

Hunnicut, Mumford Named By Oilwell to Field Posts

Appointment of Jackie R. Hunnicut and Frank Mumford, Jr., as United States Steel Oil Well Supply Division Nfield representatives at Denver City and Odessa, Tex., respectively, has been announced by William Miskimins, the division's Central Midwest area manager.

Hunnicut was employed by Oilwell in 1955 at Denver City. Mumford was with the division from 1950 to 1951, returning to Oilwell in April 1957. He has had 9 years' oil-field supply experience.

Tube Turns Names Hardison To District Manager Post

S. Merle Hardison has been appointed district manager in Philadelphia for Tube Turns, Louisville, Ky., manufacturer of welding fittings and flanges for industrial piping systems, according to John G. Seiler, president of Tube Turns, a division of National Cylinder Gas Co. Hardison succeeds W. E. Geiser, who has returned to the headquarters' staff in Louisville and has been assigned to an important phase of the company's expansion program.

Hardison joined Tube Turns in 1941 and was associated with the Louisville, Pittsburgh and Houston sales-engineering staffs before going to Philadelphia in 1948. Geiser joined Tube Turns in 1929, shortly after the company was established and was southeastern district manager from 1935 to 1940, when

better
cementing
begins...

✳..at a HALLIBURTON
BULK CEMENT PLANT

Introduced to the oil industry in 1940, Halliburton Bulk Cementing is a continuous development resulting from a sustained program of improving every phase of oil well cementing services. From bulk plant to well, Halliburton cement is blended and handled to provide smoother and more uniform slurries . . . specially formulated cements to meet individual well requirements.

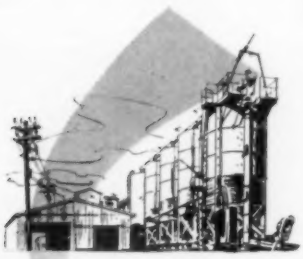
Each Halliburton bulk cement plant is equipped to mix any of the desired additives with cement, correct proportions being assured by a batching control system. Mixtures are blended to a uniform consistency, loaded into weatherproof mobile cementing units, and transported to the well site.

Halliburton Cementing helps provide maximum protection for your investment. Specify Halliburton for your cementing needs!

HALLIBURTON
OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

HALLIBURTON CEMENT ADDITIVES

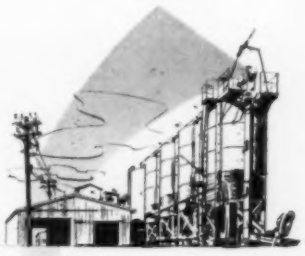
help make slurries best suited for your wells



HR-4

CEMENT RETARDER

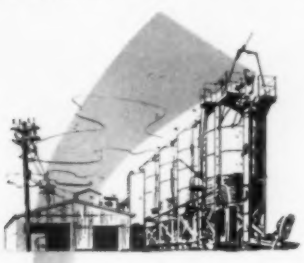
Halliburton HR-4 is a chemical retarder used with cement to retard the set and allow placement at high temperatures. When a small amount of HR-4 is added to the dry cement at the bulk plant or in the mixing water it provides a tailored composition for cementing casing in the deepest of wells.



HR-7

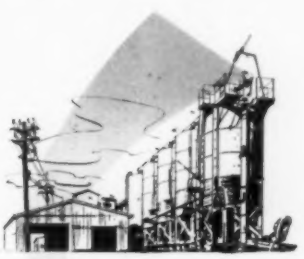
CEMENT DISPERSANT AND RETARDER

Halliburton HR-7 is a chemical dispersant and retarder for use with high gel cement compositions. This additive is effective in obtaining smoother and more fluid gel cement slurries. Most applicable in wells where moderate temperatures prevail.



HI-DENSE

Halliburton Hi-Dense is a high specific gravity weight material designed to increase the density of cement slurry for controlling high pressure gas and oil zones. Hi-Dense is ground to a fineness that requires a minimum amount of mixing water. Because of the specific gravity of Hi-Dense, it is possible to weight cement slurries to 20 lbs./gal., yet still maintain adequate pumpability and strength stability at high temperatures.



MUD-KIL

Halliburton Mud-Kil is a dry, granular material that may be mixed in the dry cement or dispersed in the mixing water. It effectively neutralizes the cement-retarding properties of quebracho and other tannins, starch, sodium carboxymethyl cellulose and lignite. Pumping time and compressive strength of cement are unaffected.

CEMENTING SERVICES

BETTER PROTECTION FOR YOUR WELLS

why this key compressor station works dependably despite these

temperature extremes

Compressor Station One is the key supply installation on the sprawling Pacific Northwest Pipeline system. Located at 6000 feet elevation near Ignacio, Colorado, the facilities boost pressure of nearly 300-million cubic feet of gas per day from the San Juan Basin gathering system. This station feeds a nearby gasoline plant before starting the gas on the long haul to the Pacific Northwest market.

In such a key spot, dependability is essential. Fish engineers carefully reviewed possible causes of trouble long before thoughts went into plans.

Extreme temperature fluctuations—from plus 100 degrees F. to minus 20 degrees F.—posed unusual problems. Under these conditions, reliable temperature control was difficult to achieve.

To be sure of providing efficient jacket water and lube oil temperatures under all extremes of ambient temperature and load, Fish designers elected to use unitized systems. Under this system, each engine has its own atmospheric cooler to take care of jacket water and lube oil cooling loads. A system of temperature control instruments was installed to provide very close control under all operating conditions. As designed, this remote station demonstrates extreme flexibility with reliability.

This is but one example of the type of advanced engineering you get from Fish. In addition, the same quality service prevails from feasibility study to project completion. If you are contemplating new or expanded facilities in oil, gas or chemicals, consult with Fish.

the fish companies

Houston

FISH ENGINEERING CORPORATION
FISH NORTHWEST CONSTRUCTORS, INC.
FISH SERVICE CORPORATION

he was placed in charge of the company's activities in the shipbuilding field. In 1942 he was made district manager at Philadelphia.

Kupper Named Manager of Sales Projects by J&L

W. O. KUPPER

W. O. Kupper has been appointed manager of sales projects, a new sales division of Jones & Laughlin Supply Division, according to Rainey Elliott, president of the division. Kupper was with U. S. Rubber Co. from 1934 to 1944 and with Ladish Co. from 1944 until joining J&L. He was formerly assistant sales manager of Ladish Co.

The administration of the new sales division will be concentrated in Tulsa. It will promote project sales primarily by use of and through J&L's line sales force and will concentrate on the sale of line pipe, valves, fittings and related items.

Petrolite Names Clote as Ass't. Advertising Mgr.

John Clote, formerly field engineer for Tretolite Co., division of Petrolite Corp., at McPherson, Kans., has been named assistant advertising manager of Petrolite Corp. and assigned to the St. Louis headquarters. Clote joined Tretolite Co. in 1952 at McPherson. He served as district editor for The Oil and Gas Journal at Tulsa and Houston.

Nelson Electric Will Show Explosionproof Equipment

Nelson Electric Manufacturing Co. of Tulsa will conduct demonstrations of explosionproof enclosures to refinery and other industrial firms during a 2-month tour of western states.

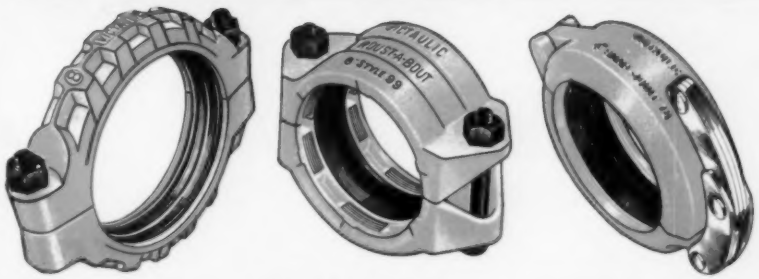
The enclosures, containing electrical junctions, are specially constructed of cast iron and are designed for use in refineries or other industrial plants where explosive gases might be present. If these gases become ignited by an electric spark, the explosion is contained by the enclosure, thus preventing a major explosion.

A special unit for the demonstration and a crew of personnel from Nelson

VICTAULIC®

METHOD OF PIPING

VICTAULIC HAS EVERYTHING...

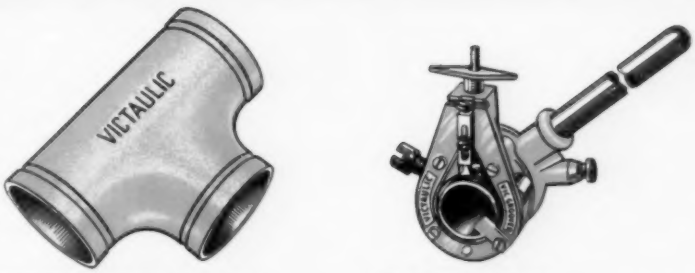


VICTAULIC COUPLINGS
Simple, fast, reliable. *Styles 77, 77-D,* for standard uses with steel or spiral pipe, — *Style 75* for light duty. Other styles for cast iron, plastic and other pipes. Sizes ¾" to 60".

ROUST-A-BOUT COUPLINGS
For plain or beveled end pipe *Style 99*. Simple, quick, and strong. Best engineered and most useful plain end coupling made — takes a real "bull-dog" grip on the pipe. Sizes 2" to 12".

VICTAULIC SNAP-JOINTS
The new, boltless, speed coupling, *Style 78*. Hinged into one assembly for fast piping hook-up or disassembly. Hand locks for savings in time and money. Ideal for portable lines. Sizes 1" to 8".

COUPLINGS FOR EVERY PIPING JOB



VICTAULIC FULL-FLOW FITTINGS
Elbows, Tees, Reducers, Laterals, *a complete line*—fit all Victaulic Couplings. Easily installed — top efficiency. Sizes ¾" to 12".

VIC-GROOVER TOOLS
Time saving, on-the-job grooving tools. Light weight, easy to handle — operate manually or from any power drive. Sizes ¾" to 8".

PLUS FITTINGS AND GROOVING TOOLS

"EASIEST WAY TO MAKE ENDS MEET"

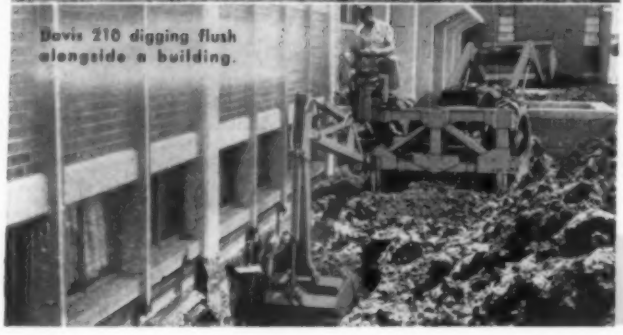
Promptly available from distributor stocks coast to coast.
Write for NEW Victaulic Catalog-Manual No. E-9

VICTAULIC COMPANY OF AMERICA
P. O. BOX 509 • Elizabeth, N. J.

YOUR DAVIS DEALER IS DEALING . . . SEE HIM NOW!

DISCOVER DAVIS

Davis Model 210 Backhoe and 102 Loader on a Model 202 Work-Bull Tractor.



Davis 210 digging flush alongside a building.

YOU CAN SEE FOR YOURSELF

— it's the greatest LOADER-BACKHOE at any price . . . on any tractor*!

Only the Davis Loader-Backhoe allows you unrestricted vision. You can see why this rig, with many such exclusive features gives you more earning power.

You sit high on the backhoe so you can see exactly where you're working and you move with the boom so you always face the bucket — just like on the big power shovels.

Only the Davis 210 Backhoe lets you dig flush alongside a building, wall, or fence. Vertical stabilizers, right-angle digging, and 10,000 pounds breakaway power give you the advantage on every job.

The Davis Loader — with built-in strength and streamlined design — has been widely copied, but never equalled.

You would naturally think that this rig would cost you more, but it actually costs less than most other makes.

*** Davis Loaders and Backhoes are available for all popular models of International, Ford, Work-Bull, Ferguson Major, Ferguson, Case, Massey-Harris, Allis-Chalmers, Oliver, John Deere, and Minneapolis-Moline Tractors.**

SOLD AND SERVICED EVERYWHERE BY BETTER DEALERS

For the name of your nearest dealer, call Western Union by number and ask for Operator 25 . . . or write direct. Please specify make of tractor.

MASSEY-HARRIS-FERGUSON, INC.
INDUSTRIAL DIVISION
1009 S. WEST ST. DEPT. OG WICHITA 15, KANSAS

Electric Manufacturing Co. will conduct the demonstrations during the tour which will include stops at Phoenix, Los Angeles, San Francisco, Salt Lake City, Casper, and Denver.

Engineered Oil Tools Names Johnston, Jennings

Blaine Johnston has been named general manager of Engineered Oil Tools, Inc., of Houston, a company formed in early 1957 to manufacture

B. JOHNSTON

W. B. JENNINGS

and market Johnston hydraulic pumping units. W. B. (Bill) Jennings has recently been employed as Central division manager, covering the Panhandle, West and West Central and North Texas, and New Mexico.

Johnston has been in hydraulic oil field machinery engineering and sales for the past 10 years. He was formerly Mid-Continent representative for S. C. Carter Co. He designed the line of Johnston hydraulic pumping units and holds patents on certain features. Jennings was formerly with Axelson Manufacturing Co. as sales and service engineer.

Armstrong Reassigns Insulation Personnel

A realignment of responsibilities for industrial insulation sales and contract operations of Armstrong Cork Co. are being made as a result of retirement of Sloane C. Martin, manager of low temperature insulation sales and assistant manager of contract operations.

J. W. Liddell will continue as manager of contract operations, being responsible for sales efforts and execution of all industrial insulation contracts, according to A. E. Pearce, general sales manager of the insulation division. The position of assistant manager of contract operations is discontinued.

J. P. Sawyer has been appointed manager of low temperature insulation and insulating refractories sales. F. S. Donnelly, Jr., has been named manager of Armaflex and sundries sales and manager of market research and new product development.

Stewart & Stevenson Names Ward Ass't. to Gen. Mgr.

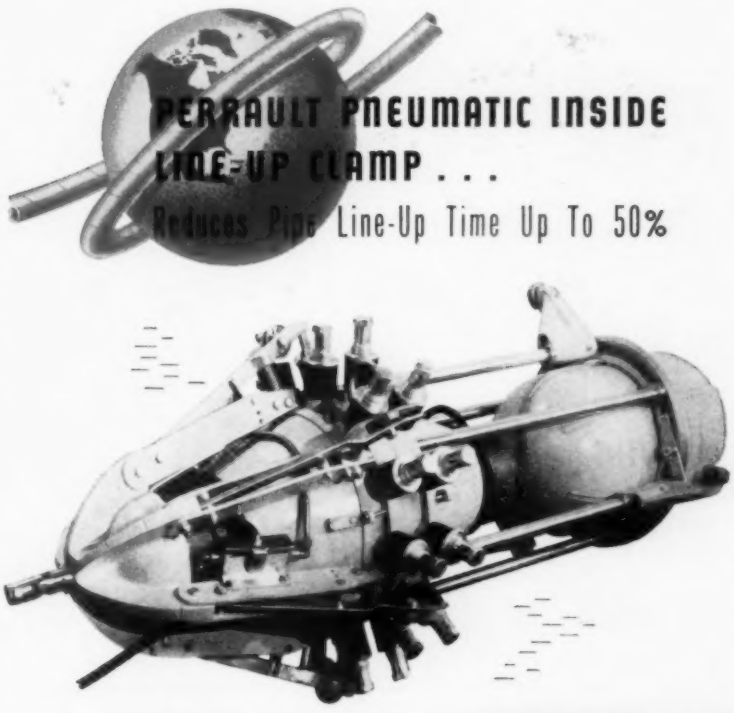
Charles L. Ward, who has been with Stewart & Stevenson since 1944, has been named assistant to the general manager for Stewart & Stevenson with headquarters in Houston. His most recent assignment with the company was in Dallas where he was executive engineer. In that capacity, he managed the government contracts division.

Stewart & Stevenson has manufacturing and fabricating facilities at the Houston headquarters plant and sales and service points throughout Texas.

Ward served with Worthington Corp. and the War Production Board before joining Stewart & Stevenson.

Bendix Names Whitney As Marketing Manager

Myron E. Whitney has been named manager of marketing for Bendix two-way mobile radio products, according



PROVED IN 27 COMPLETED PROJECTS

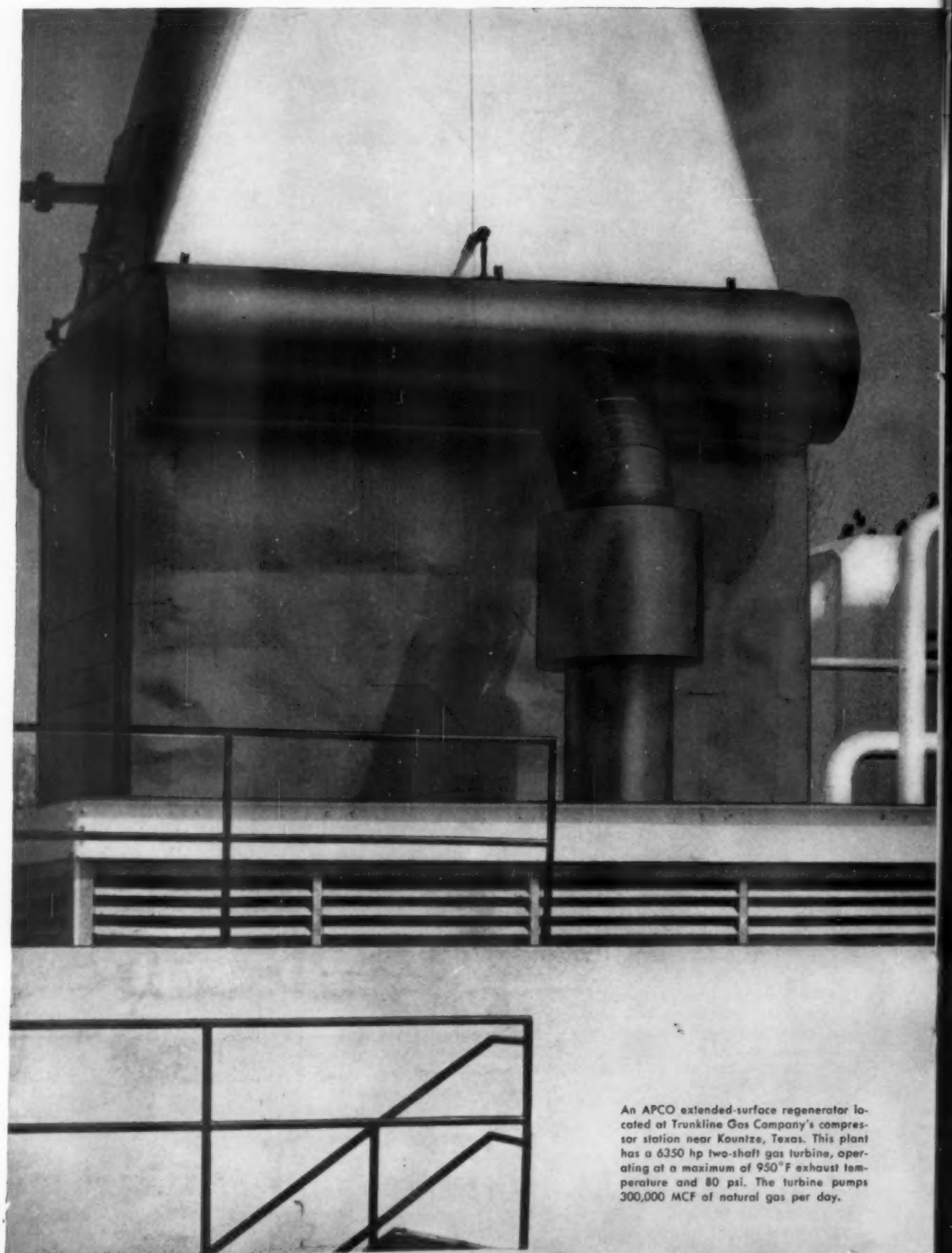
Has now been used by major pipeline contractors in all areas; coast-to-coast, and from Mexico into Canada on lines for some of the world's most important pipeline companies. Speeds jobs because air-operated studs bring pipe into true round without hi-lo hammering; makes good stringer beads quick and easy. Rental basis: For pipe sizes from 20" thru 36". More details? Call Perrault.

Everything For The PIPELINER

Coating and wrapping and cleaning and priming machines — line traveling or stationary. Glass Pipe Wrap, Asbestos Felt Wrap, Kraft Wrap, and Rock Shield. Tar-Heating Kettles, Burners, Patch Pots and Accessories. Pneumatic-Tired Lowering-In Cradles, Adjustable Pipe Cradles, Five-roller Cradles, Tongs, Hooks, Blocks, Belts, Slings, Line-up Clamps, Hand Tools, Supplies and Equipment of every sort.

PERRAULT EQUIPMENT COMPANY

1130 N. BOSTON — TULSA, OKLA. — TELEPHONE LUther 5-1103



An APCO extended-surface regenerator located at Trunkline Gas Company's compressor station near Kountze, Texas. This plant has a 6350 hp two-shaft gas turbine, operating at a maximum of 950°F exhaust temperature and 80 psi. The turbine pumps 300,000 MCF of natural gas per day.

with pipeline costs soaring...

HOW MUCH CAN APCO REGENERATOR EQUIPPED GAS TURBINES CUT STATION MANPOWER?

A gas turbine equipped with a heat exchanger can cut man-power as much as 80% . . . compared to diesel, steam turbine, or gas-engine requirements. Only 7 to 9 men, on the average, are needed to maintain a gas turbine station.

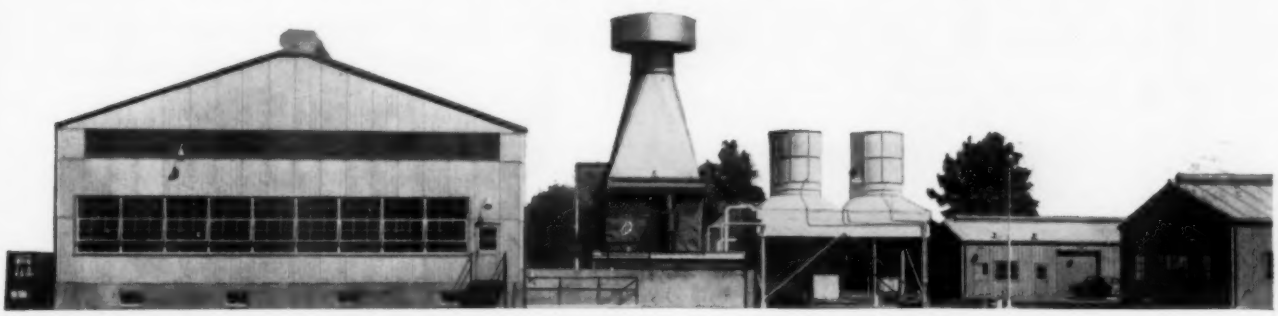
And when the heat exchanger is an APCO extended-surface regenerator, you get these extra advantages:

- The volume occupied is less than half of that required for other regenerators.
- The weight is half that of other regenerators.
- Less than 500 manhours are required for erection of a unit on a 5000 hp cycle.
- No maintenance is required.

In terms of thermal efficiency, an APCO regenerator with 75% effectiveness can increase a gas turbine cycle operating at a 6-1 pressure ratio and 1500°F *as much as 7.5% absolute.* This is 32% over a cycle with no regeneration! And represents a fuel saving of about 30%. In other words, it saves 30% of the heat contained in the turbine exhaust heat, which would otherwise be expelled to the atmosphere.

Be sure to investigate the advantage of an APCO extended-surface regenerator, if you are considering gas turbines. For details of their labor saving efficiency, write Air Preheater Corporation . . . better yet, call and arrange for our engineers to sit down with yours.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.



to Norman Caplan, mobile products manager, Bendix Radio Division, Bendix Aviation Corp., Baltimore, Md.

Whitney was for 4 years chairman of the land mobile communications section of Radio Electronics Television Manufacturers Association. In his new capacity, Whitney will apply his experience in marketing, sales and service to Bendix Dyna-Com two-way mobile radio products. Prior to his present appointment, Whitney had been assistant marketing director of two-way and portable communication products for Motorola, Inc.

Gardner-Denver Acquires Site to Expand Denver Div.

Gardner-Denver Co. has acquired 30 acres of undeveloped land near Derby, Colo., that will serve as a site for expansion of its Denver division. The site is 6 miles north of Denver.

C. H. Rieman, vice president and general manager, Denver division, said present plans call for erection of a factory on the new site to house the division's forging facilities. In addition to purchasing new equipment, the forging equipment now located at Gardner-Denver's present plant will be moved to the new location to allow for expansion of present facilities. A new building to house the boiler equipment needed to run the forging hammers at the new property will also be constructed.

For Longer Service . . . Greater Joint Strength . . .
More Footage at Lower Cost—

use

SPANG
Drilling Stems

with Forge Hammer-Welded, Fully Heat-Treated, Precision Machined Box and Pin Joints . . .

SPANG DRILLING STEMS are made of machine straightened special bar quality open hearth steel, of the right analysis to assure the greatest vibration dampening effect. Box and Pin joints are hammer-welded, fully heat-treated, and have precision machined threads to provide the strongest, most wear-resistant joints obtainable. As a result SPANG DRILLING STEMS, with high strength joints, give longer than average service and drill more footage at lower cost.

REPLACEMENT BOXES AND PINS

. . . of the same carbon steel analysis as those integral with original stems are available in all sizes, lengths and joint combinations for forge or electric welding to stems when renewal is required.

For complete information on Stems and Replacement Boxes and Pins, and for FREE CATALOG of other SPANG CABLE TOOLS, consult your nearest SPANG DEALER or write direct to:

SPANG & COMPANY

DEPT. O-1 BUTLER, PENNSYLVANIA

For over 60 years Manufacturers of Spang Weldless Jars and a Complete Line of Cable System Drilling and Fishing Tools for Oil and Gas Wells, Water Wells, Prospect Drilling and Shot Blast Holes.

Cochrane Elects Denton as New York Sales Vice Pres.

J. R. DENTON

Joseph R. Denton has been elected vice president of New York district sales by Cochrane Corp., Philadelphia, manufacturer of water conditioning and steam power equipment.

Denton was formerly associated with Calco chemical division of American Cyanamid Co. and spent several years in the New York office of Worthington Corp. as a sales engineer. He joined Cochrane in 1954 as manager of its New York district sales office. Announcement of Denton's appointment was made by T. E. McBride, president of Cochrane.

McCullough Opens Service Branch at Cortez, Colo.

B. L. MARTIN

McCullough Tool Co. has established a service branch at Cortez, according to I. J. McCullough, president. Bobby L. Martin, branch manager, formerly in charge of operations at McCullough's Hobbs, N. M., branch, is in charge of operations at the Cortez branch, which will provide 24-hour electric wire line services.

Martin has had over 10 years' experience with McCullough Tool Co. as sales representative and branch manager.

Duff-Norton Names Hodgson As Sales Promotion Manager

Edward H. Hodgson has been advanced to sales promotion manager of Duff-Norton Co., Pittsburgh, a leading producer of industrial jacks and hoists. He will be responsible for sales promotion, advertising and public relations for the company's jack and hoist divisions.

Hodgson joined Duff-Norton in 1949 as a sales representative after serving

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If you need it right on time . . .

Get hold of Higgins INC.

Box 8001 —
New Orleans 22, La.

DRILLING BARGES • DREDGES • BARGES
QUARTER BOATS • TUGS • WORK BOATS
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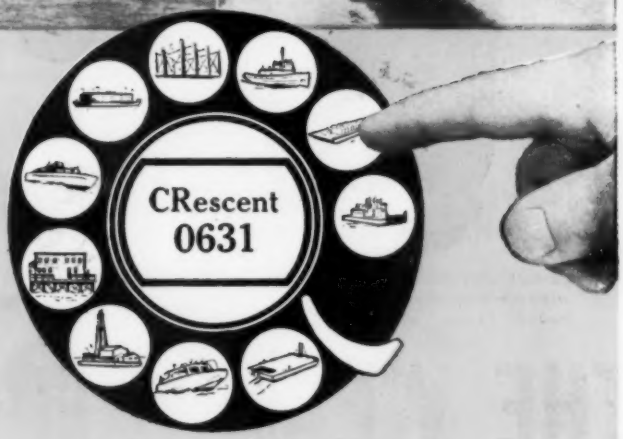
STEEL FABRICATION • PERSONNEL BOATS
SEISMOGRAPH BOATS • BULK-TYPE CARGO
BARGES • MARINE REPAIRS OF ALL TYPES



DO YOU WASTE MONEY ON OUTDATED CEMENTING METHODS?

1. Outdated cementing methods cost operators untold dollars in remedial squeeze work.
2. With today's high well costs it's more important than ever to make every dollar count.
3. Minimize remedial cementing in your well completion budget.
4. The Weatherford Technique is the industry's most up-to-date method for securing a successful primary cement job.
5. Investigate this service, proven in hundreds of wells.

Contact your nearest representative — or write to Weatherford Oil Tool Co., Inc., Houston, Texas.

WEATHERFORD OIL TOOL CO., INC.

GENERAL OFFICES: 5920 Navigation Blvd., Houston, Texas

THE WEATHERFORD TECHNIQUE

several years as a steel salesman in the Pittsburgh district. Since 1955 he has been district sales manager for Ohio.

Worthington Promotes In Marketing Division

W. C. CHEEK

William C. Cheek has been appointed Midwest region sales manager of Worthington Corp., according to T. J. Kehane, vice president in charge of marketing. John H. Loomis replaces Cheek as manager of the Chicago district office, and Hollis H. Wise is appointed St. Louis district manager.

Cheek, who joined Worthington in 1920, has served in the firm's Buffalo

J. H. LOOMIS

HOLLIS H. WISE

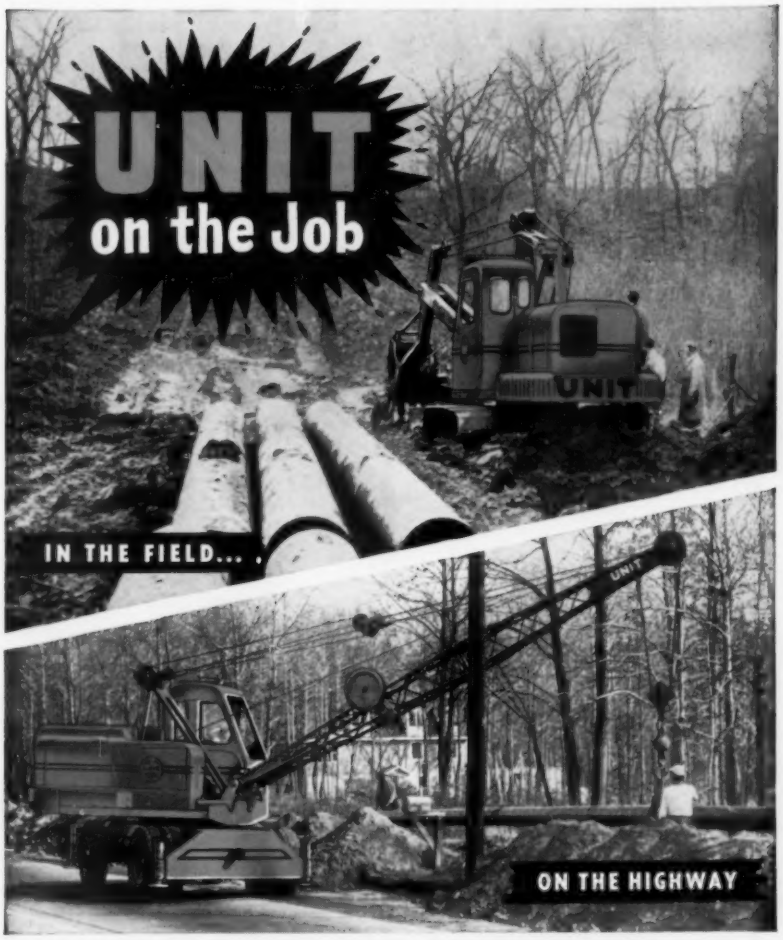
division, at the New York office, and in the Harrison, N. J., division. In 1932 he was assigned to the Chicago district office as a general line salesman, in 1937 was appointed assistant manager of the Chicago district office, and in 1945 was named manager of the Chicago office.

Formerly manager of the corporation's St. Louis district office, Loomis joined the firm in 1945, serving as an application engineer in the Buffalo division prior to his assignment to the Chicago district office as compressor specialist in 1947. He was appointed manager of the St. Louis office in 1955.

Wise joined Worthington's Detroit office in 1938 and was named office supervisor in 1940. He subsequently served as Louisville resident salesman and Cincinnati general line salesman. In 1953 Wise was named resident general line salesman out of Indianapolis, the post he held until his present appointment.

Lohse Joins Ever-Tite

Ralph W. Lohse, formerly manager of the Chicago division of the Amco Corp., has joined Ever-Tite Coupling Co., Inc., as West Coast manager. Lohse will make his headquarters in Los Angeles and will cover the eight



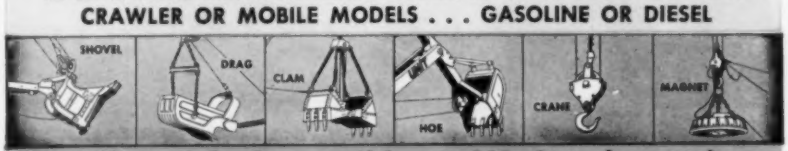
Where Pipeline Goes...UNIT Goes!

In the field where the going is tough, UNIT TRENCHOES have the traction and power for continuous ditching to meet pipeline schedules. For laying pipeline along the right-of-way, where the going is smooth, the self-propelled mobile UNIT offers road travel speed, plus accurate lift and swing control. Designed for speed and stability, UNIT crawler and mobile equipment are built to meet every trenching and handling job required in pipeline construction work.

SEE FOR YOURSELF: *Let us send you our novel TV Brochure. It illustrates the complete UNIT line.*

UNIT CRANE & SHOVEL CORPORATION
6327 WEST BURNHAM STREET • MILWAUKEE 14, WISCONSIN, U. S. A.

½ or ¾ YARD EXCAVATORS...CRANES UP TO 20 TONS CAPACITY
CRAWLER OR MOBILE MODELS . . . GASOLINE OR DIESEL



All Models Convertible to ALL Attachments!

A 7187-2/3-C

HOW TO GET ADDITIONAL RECOVERY FROM SMALL VOLUME GAS STREAMS— DRYEX®

The efficient, profitable recovery of raw gasoline from gas streams of 5-50 million cu. ft. per day volume is now provided by "Dryex", a completely automatic skid-mounted adsorption process unit developed by Delta.

The "Dryex" unit affords safe, reliable recovery of 85% of the commercially valuable liquids in such gas streams, at an average operating cost of approximately 15¢ per barrel. "Dryex" may also be used profitably on large, rich gas flows.

For full information regarding "Dryex" and other units in Delta's modern line of oil field equipment and pressure vessels for the chemical, petro-chemical and petroleum industries, *ask the Delta man.*

DELTA TANK MANUFACTURING COMPANY, INC.
BATON ROUGE, LOUISIANA
PLANTS: BATON ROUGE, LA. • MACON, GA. • BEARDSTOWN, ILL.
EXPORT OFFICE: INTERNATIONAL TRADE MART, NEW ORLEANS, LOUISIANA
FABRICATORS OF OIL FIELD EQUIPMENT, MATERIAL HANDLING EQUIPMENT, AND PRESSURE VESSELS.

OAKITE
LSD

Liquid Steamcleaning Detergent

The label is hardly dry on Oakite LSD—and already enthusiastic reports are coming in about this new liquid detergent compounded specially for steamcleaning.

With this modern detergent you get the full benefits of power cleaning—convenience, speed, economy. It's just the thing for removing those oily, greasy soils typical of refining operations. And LSD means Low Steamcleaning Dollars because it takes only 1 to 2 oz./gal. concentrations for powerful cleaning action.

Here are some extra advantages of Oakite LSD:

- **Goes into solution instantly**
- **Minimizes coil clogging**
- **Useful on light or heavy cleaning**
- **Rinses clean with plain steam**
- **No objectionable fumes**
- **Works equally well in self-generating steam units or Oakite steam guns**

Ask your local Oakite Technical Service Representative to demonstrate this new Oakite development, or write for details to Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

OAKITE
SPECIALIZED INDUSTRIAL CLEANING
MATERIALS · METHODS · SERVICE
SCIENCE

Export Division Cable Address: Oakite

Technical Service Representatives in Principal Cities of U. S. and Canada

western states to assist Ever-Tite distributors who call on petroleum, petrochemical, and chemical companies.

Standard-Southern Names Augsburger to Sales Staff

John J. Augsburger has been appointed to the Houston sales staff of Standard-Southern Corp., according to Gerald Rauch, president.

Augsburger has been with the oilfield supply phase of the oil industry for the past 15 years. He will contact the major oil companies and independent oil producers headquartered in Houston.

Standard-Southern supplies pipe, valves, fittings and materials to the oilfield, refinery and construction companies of Texas, Louisiana, Oklahoma and New Mexico. Warehouses are in Beaumont, Houston and Odessa. Sales offices are located in Baton Rouge, Dallas, Midland and Tulsa.

Geophysical Service Names Graebner as Geophysicist

R. J. Graebner has been appointed as geophysicist for U. S. and Canadian operations of Geophysical Service, Inc., according to Vice President R. C. Dunlap, Jr.

Graebner will provide assistance to GSI seismic field parties and data processing centers and maintain close contact with the research and application sections of GSI's geophysical engineering department. In addition, he will work on long-range planning of new techniques and procedures to be used both in the field and in GSI's data processing offices.

Graebner joined GSI in 1949 as a computer trainee. Since that time he has served as a computer and seismologist. Prior to his recent appointment he was senior research seismologist.

Dallas Tank Co. Names Ponkey and Peairs

E. Edwin Ponkey has been named general manager and assistant to the president of Dallas Tank Co., Inc. Allen M. Peairs has been appointed sales manager of the newly expanded custom engineering division of the company, according to Samuel B. Ballen, president and chairman of the board.

Ponkey currently is president and chairman of the board of Win-Nar Industries, Inc., and was previously executive vice president and general manager of the Security Engineering Division of Dresser Industries. As gen-

NOW . . .

in 3 sizes

14" – 20" – 24" Sheaves

8 – 12 – 25 Ton Capacities

Well Loggers

FLOOR BLOCKS

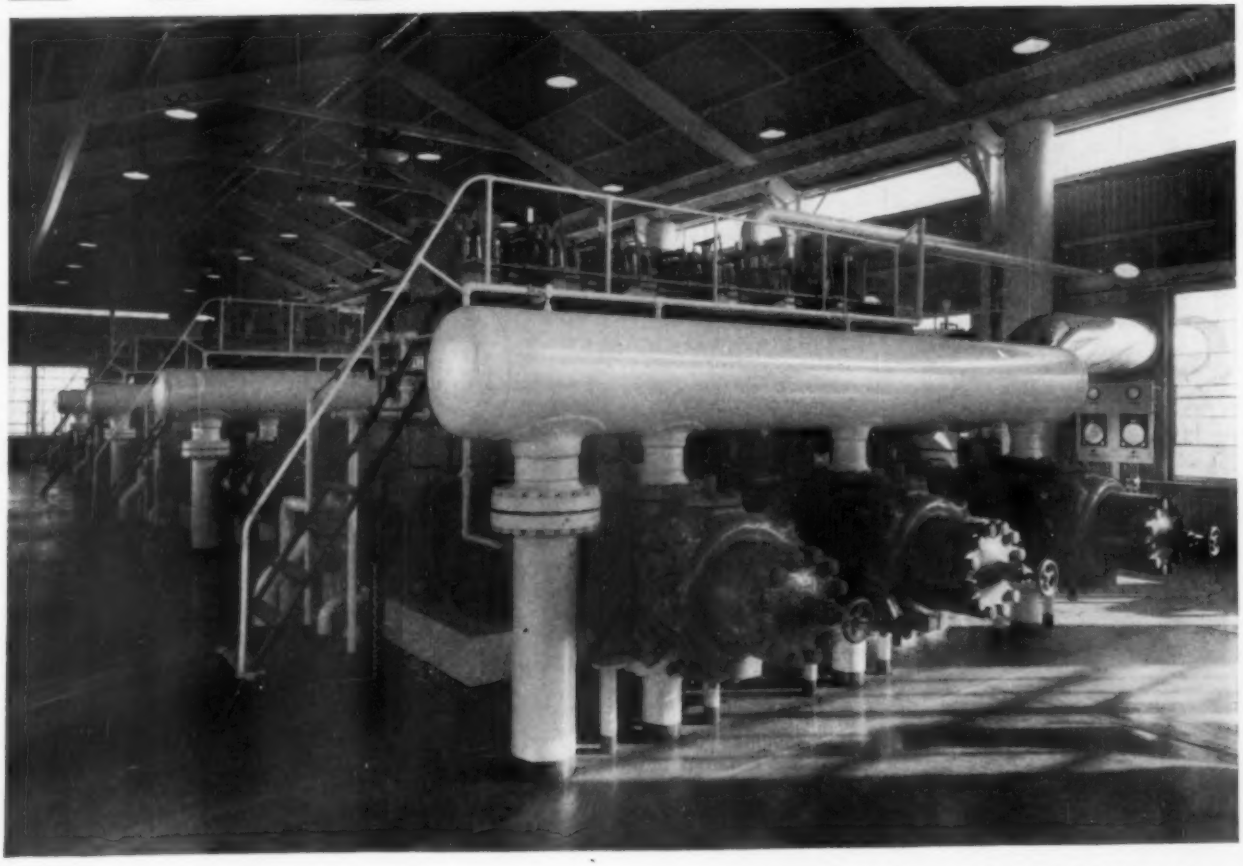
to meet your every requirement

Alloy steel flame hardened Sheaves mounted on double row Timken Bearings—Permanently sealed with J-M Klipper Seals.

High-tensile aluminum housings reduce weight without sacrificing strength.

McKISSICK
McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma

431,190
HORSE



Since Clark introduced the world's first 2-cycle
turbo-supercharged gas-engine-driven compressor in 1953,
over 431,000 bhp. of these modern ultra-efficient units
have been ordered by industry.

POWER

of Clark Turbo-supercharged Compressors now operating or on order

In the Clark tradition, these TLA and TRA units
don't have to be babied or pampered when the going gets rough.
Because they are specifically designed for turbo-supercharging
rather than being beefed-up lightweights, they possess the stamina
to back you up under the most difficult load conditions.
Seven years of experimental and development work *prior* to
their introduction make their outstanding performance possible.

The TLA-TRA have been field-proved by over
1,000,000 compressor hours on stream.

For modern, efficient, trouble-free compressor horsepower at its best,
choose a Clark TLA-TRA. Seven models from 1100-3400 bhp.

CLARK BROS. CO., OLEAN, NEW YORK
One of the Dresser Industries
Offices in Principal Cities Throughout the World

Turbo-Supercharged Compressors

eral manager of Dallas Tank. Ponkey will be responsible for over-all operations, including the expansion of all phases of steel plate fabrication at the company's Dallas plant.

Peairs was formerly with Bethlehem Steel Co., Ross Heater & Manufacturing Co. and Foster Wheeler Manufacturing Co. He will be responsible for design and sales of special process equipment.

Four associates have also joined the company in Peairs' department: B. J. Rasco and Harold Walker as chief estimators; Jack McElvain as head of the drafting division; and R. E. Griffin as chief of the quality control division.

New Shop Increases Avondale Activities

The recent completion of an all-new machine shop at the River Plant (main yard) of Avondale Marine Ways, Inc., coupled with the purchase of many new and special-order production tools, points up another major expansion for this firm.

Avondale today has a combination of machine shop facilities to enable it to serve marine, petroleum and chemical industries. These recent enlargements mean that Avondale has modern machine shops, heavy and light tools to specialize in work of every type and to conform to the most rigid specifications and exacting engineering requirements.

In order to acquaint industry with its new potential, Avondale has recently organized an industrial contracts division with William Alexander as its head and George F. Crozier as salesman.

Baker Appoints European Technical Representative

Ing. Hans Szepanek of Celle, Germany, has been appointed Baker Oil Tools, Inc., representative for West Germany and Austria. He will also act in a similar capacity in such other European countries as time and circumstances will permit.

Szepanek spent 7 years with Gewerkschaft Elwerath, in Germany, prior to joining Baker in May 1957. Since that time he has been training at Baker's Houston and Los Angeles facilities as well as in the oil fields of Texas, California and New Mexico.

FAGRO, G.m.b.H., Hanover, will continue to function as sales representative for Baker products in West Germany and Austria, regardless of whether the products are manufactured in Germany or the United States. FAGRO will also continue to furnish technical assistance.

American Meter Names Two to Sales Posts

Clifford E. Alden has been named sales engineer for the Wynnewood, Pa., sales district and J. P. Wilson III has been appointed sales representative for the Atlanta sales district, according to C. B. Dushane, Jr., American Meter Co.'s vice president, sales.

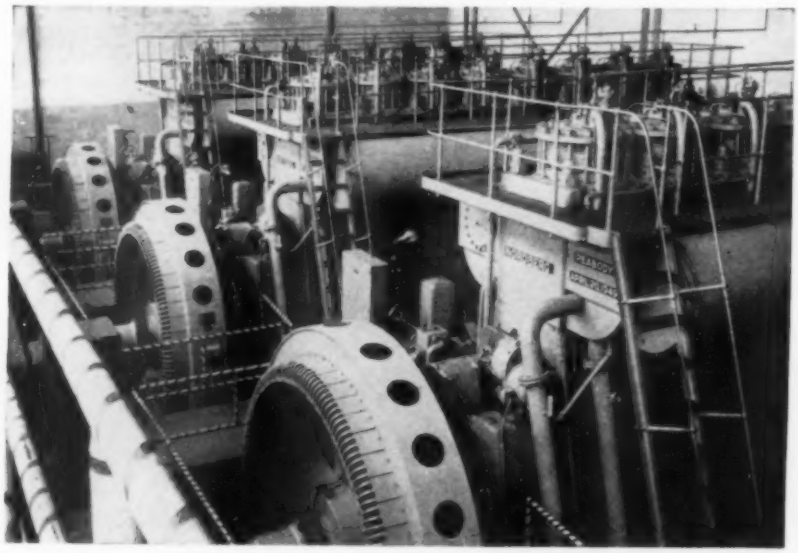
Alden was formerly with Foxboro Co. and Neptune Meter Co. Alden and Wilson have recently completed American Meter's 6 months sales training course at the Erie, Pa., plant.

Tex-Tube Completes Electric Weld Tube Mill

Completion of a new electric resistance weld mill to produce line pipe and tubing has been announced by Tex-Tube, Inc., Houston. This mill is specifically designed to produce tubular goods in size ranges from 1-in. through 6⅝-in. Tex-Tube has secured an American Petroleum Institute license covering tubular goods.

The Houston plant of Tex-Tube is located on 37 acres and is comprised

Look to COOK for Better Rings!



Peabody, Mass. Electric Company Swears by Cook Piston Rings!

Better Performance Since Installation of Cook Rings!

All three of Peabody Electric Company's 3200 H.P. Diesel engines are shown here. In 1956 these engines were required to operate for 11,375 hours and generated 19,609,100 kilowatt hours. All three were equipped with Cook Piston Rings and gave trouble-free performance throughout the year.

This record is a tribute to Peabody's excellent management and operating personnel — *and* to the outstanding quality of Cook Piston Rings. If you're looking for a seal with the savings built in, write direct, today, for product information and the name of your nearest Cook representative. Address: C. Lee Cook Company, 934 South Eighth Street, Louisville 3, Kentucky.

C. LEE COOK COMPANY

Division of Dover Corporation

Rings and Packings Since 1888

"We use American Tiger Brand Wire Rope in all our rigs—it gives the best service."

C. B. Leatherwood
Leatherwood Drilling Co.
Jacksboro, Texas

THE Leatherwood Drilling Company has been using Tiger Brand Wire Rope for more than three years on all their rigs. Before this, they tried a number of different ropes but found that Tiger Brand gave the best service.

Rig No. 1, shown here, is equipped with 1750 feet of 1⅛" Tiger Brand with independent wire rope core. They cut back 36½ feet after every 700 ton-miles and find that this practice gives long service life.

Leatherwood Drilling Company keeps accurate ton-mile records which they consider to be the best method for judging wire rope life. That's why they use American Tiger Brand on all their rigs. It means lower wire rope costs and less rig time wasted in changing ropes.

DRILLING A WILDCAT WELL near Jacksboro, Texas with 1750 feet of Tiger Brand Wire Rope.

C. B. LEATHERWOOD, PRESIDENT (right), and Johnny Houston, Driller on Leatherwood Rig No. 1. Wire rope is kept well-lubricated.

AMERICAN STEEL & WIRE DIVISION
United States Steel, General Offices: Cleveland, Ohio
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

USS

UNITED STATES STEEL

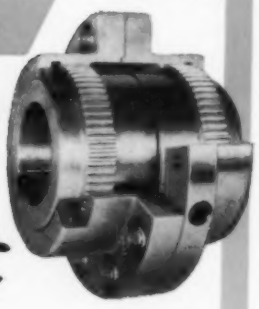
Waldron couplings on a fan drive of jacket water coolers.

by specifying

WALDRON

Gear Couplings

you get



STRENGTH —Hubs and cover sleeves for sizes 1¼ A through 7A are machined from tough steel forgings. Hubs are keyed to the shafts. The two one-piece cover sleeves function as a single, rigid unit serving as a floating connecting link between the hubs. High strength of forgings makes possible a very compact coupling with low rotating inertia.

RELIABILITY —There are no flexible parts to bend or break and the coupling is dust, moisture, and oil tight. Patented Walflex seal is positioned where centrifugal force is least. Clearance between teeth in hubs and sleeve is engineered so that an oil wedge always separates them, taking the wear.

SERVICE —Plenty of rough bore couplings, already assembled—on the shelf for *immediate* delivery. Finish bored standard couplings shipped to meet customers' schedules. We are geared up to give you realistic delivery on *any* type of couplings.

▸ Ask for Catalog 57

JOHN **WALDRON** CORP.

NEW BRUNSWICK, NEW JERSEY

Representatives In Principal Cities

of three mill buildings 50 ft. wide by 300 to 500 ft. long. Extending from these buildings are overhead craneways which handle raw materials and the complete line of tubular goods for which Tex-Tube is distributor.

T I Appoints Harris to Marketing Research Post

Donald R. Burrus has been appointed marketing research manager of Texas Instruments, Inc., according to S. T. Harris, vice president, marketing. Burrus will be in charge of company-wide marketing research activity, including long-range economic and marketing forecasts and analyses, and of market planning and development.

Burrus served with General Electric Co. prior to joining Texas Instruments.

L. B. Foster Adds Hickey, Foster, Giles to Staff

Ralph E. Hickey and James R. Foster have been appointed sales engineers for L. B. Foster Co., Houston. E. G. Giles has been made assistant manager of the order and traffic department. Previously he was in the Houston office of Fort Worth Steel & Machinery Co.

L. B. Foster is a national distributor of steel sheet piling, pipe, and rail and track accessories. Other offices are in Pittsburgh, New York, Chicago, Atlanta, and Los Angeles.

Mid-Continent Promotes Seven to Sales Posts

New city salesman at Odessa, Tex., is E. J. Kreyenbuhl, former field salesman at the same location for Mid-Continent Supply Co.

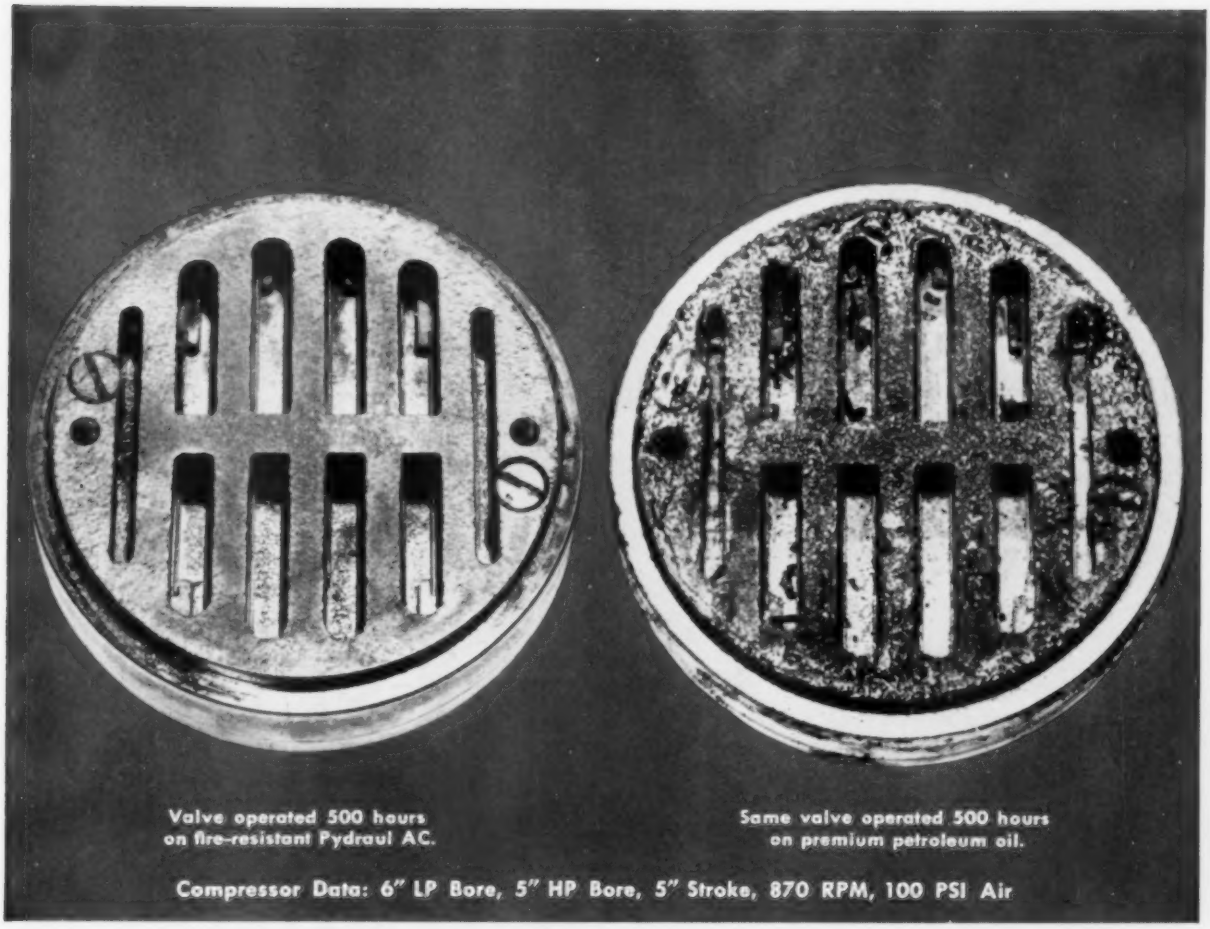
Assuming duties as field salesmen are H. R. Blakemore, Magnolia, Ark.; J. T. Cloyd, Kermit, Tex.; G. E. McHugh, Odessa; M. B. Parker, Laurel, Miss.; R. W. Ramey, Jr., Hobbs, N. M.; J. L. Reed, Sundown, Tex.; and R. O. Womack, Shreveport, La.

These promotions were announced by President Ken W. Davis.

Wolverine Appoints Moore As Eastern Sales Manager

F. F. Moore, Jr., has been appointed eastern district sales manager for Wolverine Tube, according to John Dumser, director of sales for this manufacturing and fabricating division of Calumet & Hecla, Inc.

Moore has served in sales capacities with Wolverine in New York for the past 10 years. For the last several years


Valve operated 500 hours
on fire-resistant Pydraul AC.
Same valve operated 500 hours
on premium petroleum oil.
Compressor Data: 6" LP Bore, 5" HP Bore, 5" Stroke, 870 RPM, 100 PSI Air

New Pydraul AC lubricant virtually eliminates fire danger two ways—first, by its inherent fire resistance, and second, by keeping air compressor systems freer from flammable carbon deposits. It can actually cut compressor maintenance costs because it runs cleaner, as proved in side-by-side photos of an exhaust valve operated in the same system with only the lubricant changed.

Photo proof: You reduce fire danger—cut upkeep costs with new PYDRAUL AC compressor lubricant

Extensive tests backed by successful field experience throughout industry prove conclusively that Pydraul AC protects against fire and explosion hazards, gives excellent lubricity and can even cut upkeep costs by reducing build-up of carbon deposits within the system.

Fire danger lurks in flammable lubricants and their residue deposited in compressed air cylinders and piping. Eliminate it now in your compressor, any size, any make. Conversion is easy . . . essentially, just drain your flammable oil and replace with fire-resistant Pydraul AC.

Send this coupon for the "full story" technical bulletin on Pydraul AC. It covers everything you ought to know, including detailed properties and field experience.

Pydraul: Reg. U. S. Pat. Off.

Monsanto®

Organic Chemicals Division
MONSANTO CHEMICAL COMPANY
Functional Fluids, Dept. O
800 N. 12th Blvd. • St. Louis 1, Mo.

Please send me the Pydraul AC bulletin.

Name.....Title.....

Firm.....

Address.....

City.....State.....

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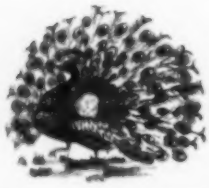


TO SERVE OIL MEN THROUGHOUT

A 5 STATE AREA. YOU CAN

ALWAYS GET AROUND-THE-CLOCK

SERVICE AT ANY **UNITED SUPPLY**

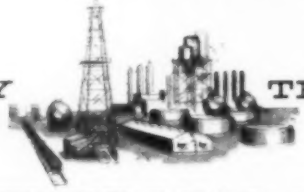
STORE NO DRILLING RIG OR

PRODUCING LEASE IS BEYOND THE

REACH OF YOUR **UNITED SUPPLY**

MAN . . AND HE ALWAYS GETS

THERE IN A HURRY IN THE OIL

COUNTRY  THESE SIGNS

ALWAYS LEAD YOU TO A NEARBY

UNITED SUPPLY STORE.

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

YOU CAN RELY ON UNITED SUPPLY!
UNITED SUPPLY
COURTESY • SERVICE • DEPENDABILITY

he has been assistant district sales manager.

The eastern district's sales activities will be coordinated by Moore from the district's headquarters in New York.

Averill Joins Staff of Anderson-McConnell

William R. Averill, formerly copywriter for the Halliburton Oil Well Cementing Co., account at Herbert E. Hill Advertising, Los Angeles, has joined Anderson - McConnell Advertising Agency, Inc., Los Angeles, as petroleum copy chief.

Pierce Joins New York Sales Staff of Delta Tank

Merrill L. Pierce has been appointed to Delta Tank Manufacturing Co., Inc.'s New York City sales engineering staff, according to William V. Rathbone, Delta's vice president in charge of sales.

Pierce joined Delta Tank in 1955 as time study supervisor and labor estimator in the company's pressure vessel division. He earlier was active in time study fields with a metal fabricator in Houston.

Lone Star Officials Visit Brown Oil Tool Plant

Four production officials of Lone Star Production Co. received the latest data on packers recently when they visited the Brown Oil Tool Co. plant in Houston. A feature of the tour was actual demonstrations at Brown's test well adjacent to the new plant on Katy Road. Ready to go into the test hole here is a Brown DS-8, the upper packer used in dual string completions. At left pointing out the highlights is John Feezer, sales manager. Others are Ray Brown, vice president; Gil Womack, Brown sales representative; E. D. Anderson, Dallas, Lone Star superintendent of production; Earl A. Edwards, Athens, Lone Star production foreman; T. O. Robinson, Brown sales representative; Charles Coker, Duncan, Okla., Lone Star production foreman; and James Callarman, Jacksboro, Lone Star production foreman.

Leeds & Northrup Forms Canadian Subsidiary

Organization of Leeds & Northrup, Canada, Ltd., a wholly owned subsidiary of Leeds & Northrup Co. of Philadelphia, has been announced by I. Melville Stein, chairman of the board of the new company and president of its parent organization. The firm, located at Toronto, will manufacture and distribute the electronic controls and measuring instruments formerly supplied from the United States.

President of the new company is J. William Robinson, formerly of Philadelphia and more recently coordinator of western operations for Leeds & Northrup. Production manager is J. Robert Gowen, also formerly with L&N in the West, and office manager is R. C. Park of Toronto. Other officers are D. H. Schultz, vice chairman; S. Loidl, Jr., treasurer; and L. A. Blake, secretary. Gowen is assistant secretary. Directors are Stein, Schultz and Robinson.

Westinghouse Names Fulton To Heat Transfer Post

David C. Fulton has been appointed manager of the heat transfer apparatus

SAVE VALUABLE FIELD TIME WITH ENARDO CLOCKS
Save time and trips by installing an Enardo Clock Shut-Off Valve.
You can soon pay the initial cost of installing the Enardo Clock by saving the return trips necessary to check installations.
The Model "W" Clock is designed to control the flow of low pressure gas or liquid and to shut off the supply at a predetermined time, with a positive bottle tight seal. Valve will function at operating pressures up to 100 p.s.i.
The Enardo "MB" and "A" time cycle switches are designed to control electrical circuits on pumping engines and other equipment. They will shut-down the engine at any number of hours, up to 22 hrs. on the 24 hr. model; and 11 hrs. on the 12 hr. model. All clocks are manually wound and set.
Always look to Enardo for the finest in oil field equipment.
"A" & MB Type Time Cycle Switch
"W" Clock Shut-Off Valve
ENARDO
manufacturing co.
BOX 1647 • TULSA, OKLAHOMA

2 BIG REASONS WHY MAJOR PIPELINES

1 LOW MAINTENANCE. Bingham Pipeline Pumps are of "Double Volute" design, insuring perfect hydraulic radial balance of rotating element. "Hydraulic Radial Balance" eliminates unequal pressures on the rotating element—"**Side Push**"—which is the primary cause of wear and maintenance in conventional pumps. Also this feature, which eliminates shaft deflection, permits **mechanical seals** to establish and maintain uniform track between the contacting faces. This prevents leakage and seal face wear, resulting in *long seal life.*

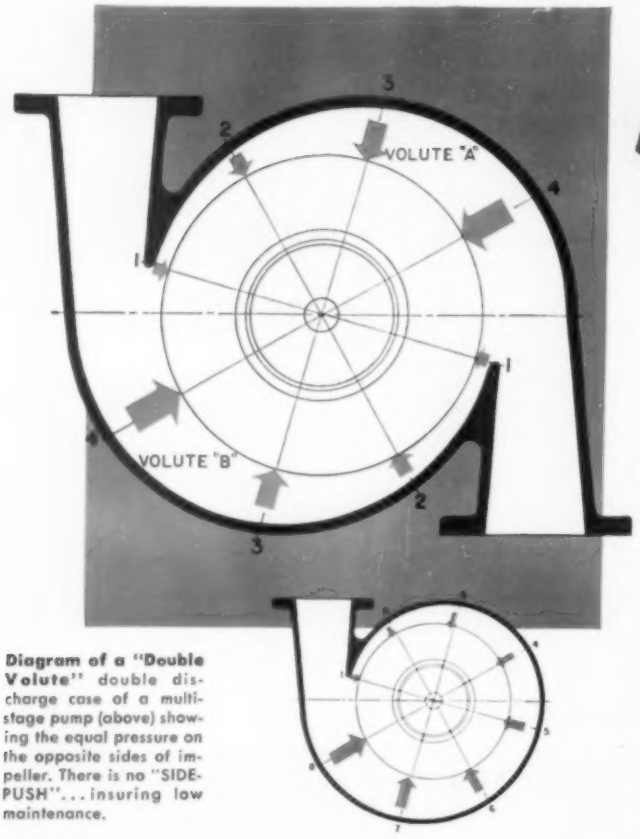
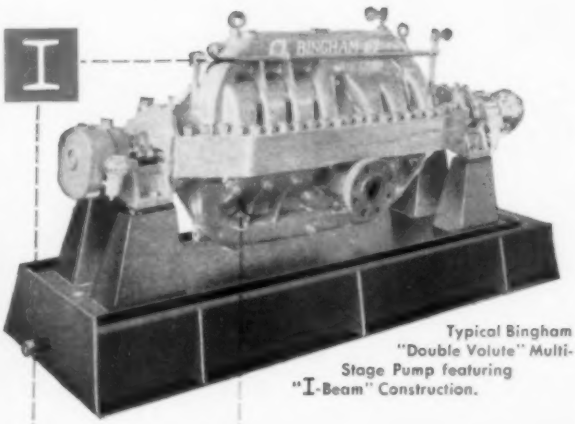


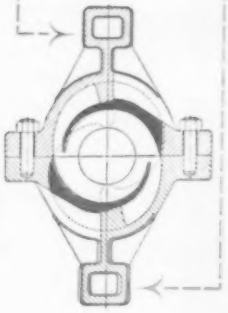
Diagram of a "Double Volute" double discharge case of a multi-stage pump (above) showing the equal pressure on the opposite sides of impeller. There is no "SIDE-PUSH"... insuring low maintenance.

Diagram of "Single Volute" pump case (immediately above) showing unequal pressures at opposite points around the periphery of the impeller. These unequal pressures cause "SIDE-PUSH" on the rotating elements, causing wear of rotating parts and, frequently, high maintenance.

2 ASSURED CASE STRENGTH FOR HIGH-PRESSURE SERVICE



Typical Bingham "Double Volute" Multi-Stage Pump featuring "I-Beam" Construction.



A transverse cross-section of Bingham "Double Volute" Multi-Stage Pumps, showing identical cross-overs cast integrally with the upper and lower halves of the pump casing.

Integral cross-overs in Bingham "Double Volute" multi-stage pumps produce casings of maximum strength for high pressure service because each cross-over is cast integrally with its half of the pump casing, and thereby becomes a structural member of Bingham's "I-Beam Truss Construction".

This feature, found only in Bingham pumps, increases the strength of the pump casing to such an extent that it can safely withstand operating pressures up to 2000 psi with standard construction (higher pressures with special construction).

Bingham "Double Volute" Multi-Stage Pumps will best serve your pipeline operations, as they are now serving major pipelines. Write to your nearest Bingham office for "Double Volute" Bulletin or additional information.

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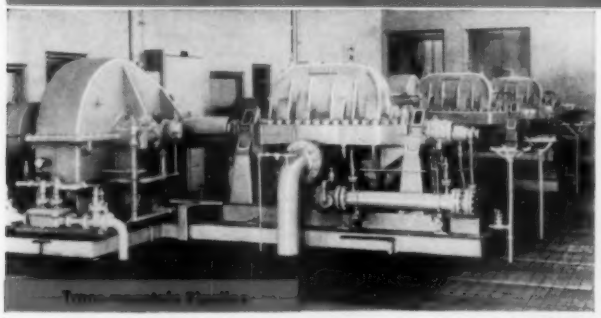

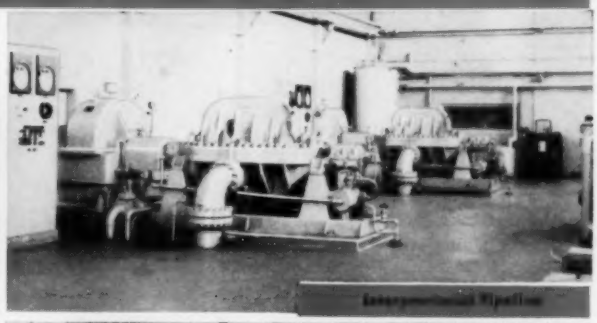

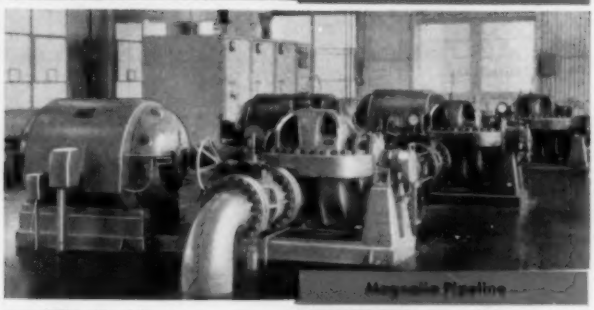

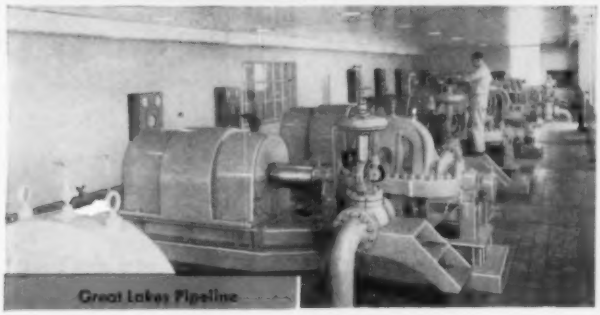

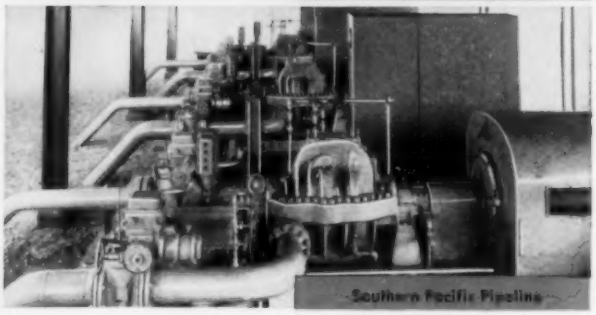

PARTIAL LIST OF MAJOR PIPELINES WITH BINGHAM "DOUBLE VOLUTE" PUMPS IN OPERATION OR ON ORDER

Arabian Neutral Zone Pipeline
Ashland Oil Pipe Line
Brazilian Gov't Pipeline
Buckeye Pipeline
Cal Tex Pipeline
Cherokee Pipeline
Cities Service Pipeline
Continental Pipeline
El Paso Pipeline
Esso Standard Oil Pipe Line
Frontier Oil Pipe Line
Great Lakes Pipeline
Humble Oil Pipeline
Interprovincial Pipeline
Interstate's Pipeline
Israel Pipeline
Kaneb Pipeline
Lakehead Pipeline
Magnolia Pipeline
Minnesota Pipeline
Okla.-Miss. Pipeline
Pasotex Pipe Line
Pembina Pipeline
Pemex Pipeline
Plantation Pipeline
Salt Lake Pipeline
Service Pipeline
Southern Pacific Pipeline
Shamrock Pipeline
Shell Pipeline
Spanish Air Base Pipeline
Standard Oil of Indiana Pipelines:
1. Dubuque-Moorhead Pipeline
2. Mandan-Moorhead Pipeline
3. Whiting-River Rogue Pipeline
Sun Pipeline
Tidewater Assoc. Pipeline
Trans-Mountain Pipeline
Trans-Northern Pipeline
Tuscarora Pipe Line
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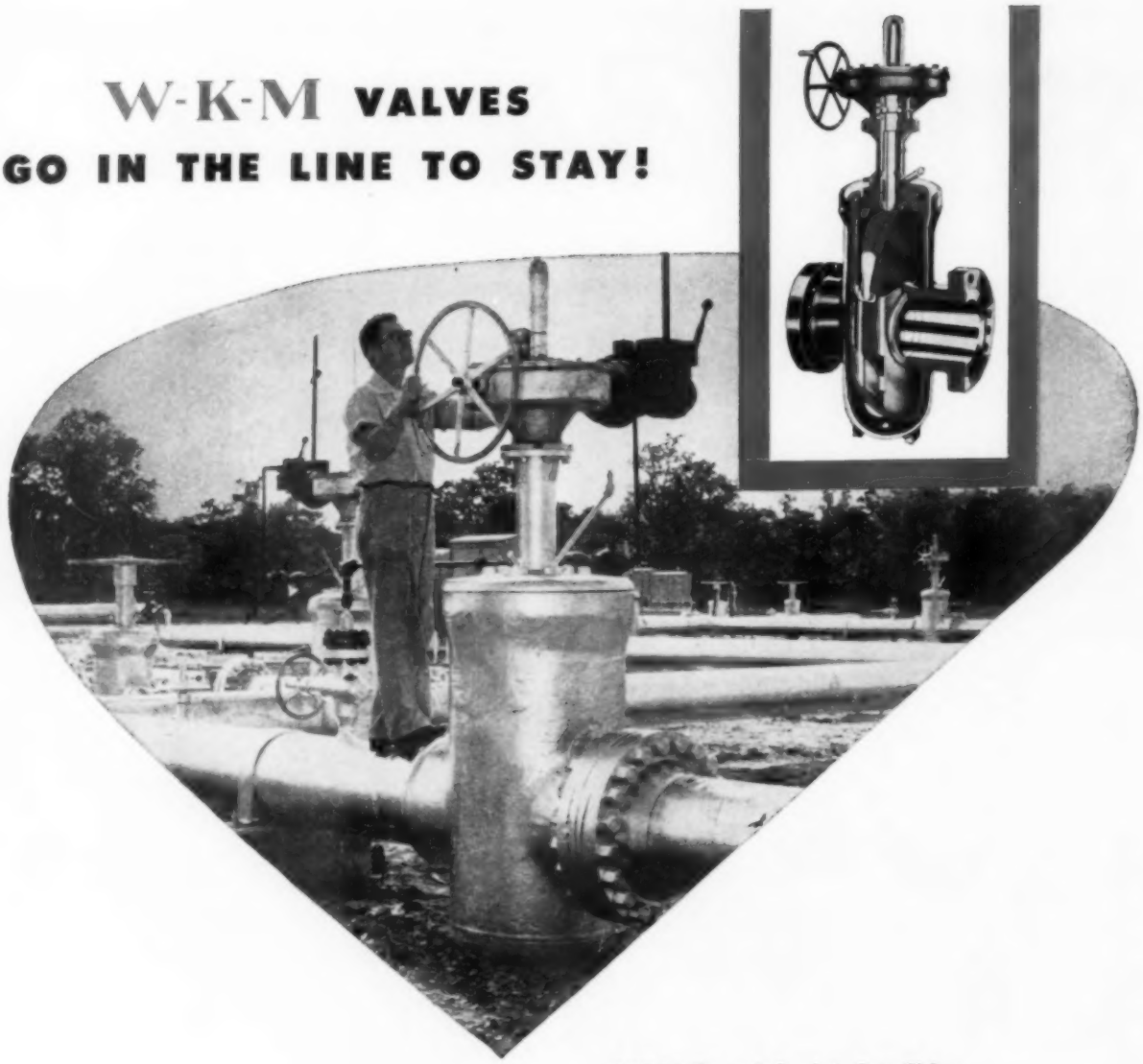

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department for the steam division of Westinghouse Electric Corp., according to W. C. Rowland, vice president of the steam division.

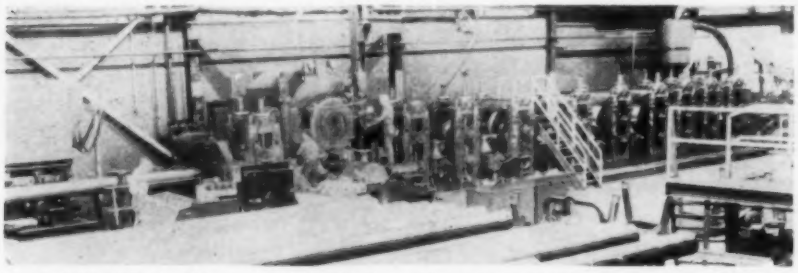
Since 1955 Fulton has been manager of the marine section steam sales department. He joined Westinghouse in 1939 and has served in sales capacities at Seattle, Wash., Portland, Ore., and San Francisco. In 1953 he was appointed Pacific Coast industrial sales manager.

J&L Starts Production at New $8,000,000 Pipe Mill

Jones & Laughlin Steel Corp. has started production of electricweld line pipe, a new product for J&L at its new $8,000,000 electricweld pipe mill at the Aliquippa, Pa., works.

All operations are controlled from strategically located push-button stations. The speed of each unit is adjusted automatically to synchronize with other units.

Guesswork has been taken out of forming a strip of steel into pipe and welding it, according to J&L engineers. For one thing, the 2,300-volt electric current is fed directly into the welding transformer, eliminating intermediate transformers. Forging pressure (the pressure forcing the edges of the strip together) is electronically measured, allowing the operator to maintain a predetermined pressure, thus assuring the quality of the weld.



Jones & Laughlin Steel's new electricweld pipe mill produces electricweld pipe in a size range up to 12¾ in. o.d.

A closeup of the welding wheel at the electricweld tube mill of Jones & Laughlin Steel Corp. shows how the strip steel is rounded by rolls and electrically welded. The fluid serves as a lubricant throughout the process.

In the new mill, electricweld pipe is made by successively cold forming flat steel strip or skelp into a tubular shape, and then welding together the butted edges by the electric resistance method.

The mill's raw materials—hot rolled coils of strip steel — currently are

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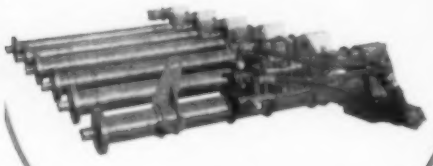

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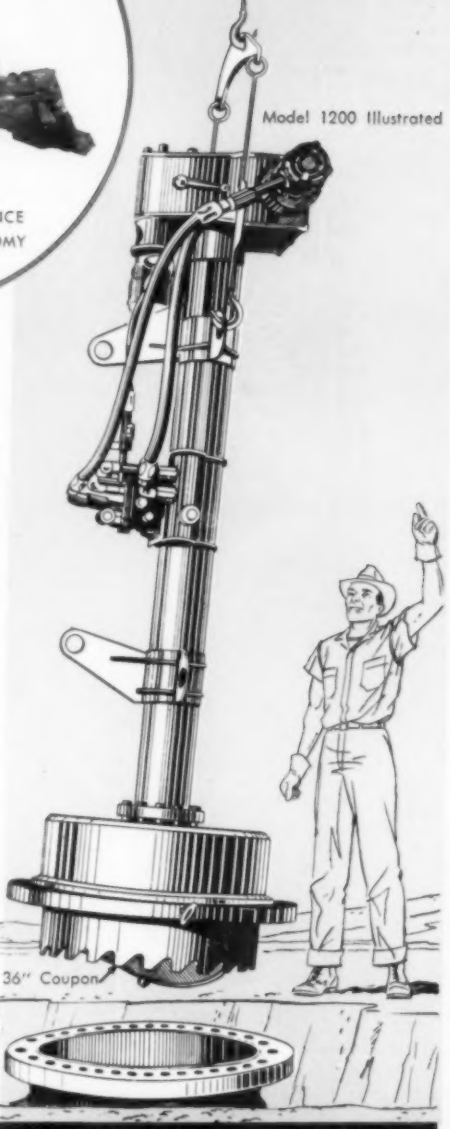

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shipped to the Aliquippa works from J&L's Cleveland and Pittsburgh works, but will be obtained from Aliquippa's new 44-in. hot strip mill when it is completed later this year.

Robert G. Riegel, who has had extensive experience in the production of electricweld pipe, is the superintendent of the electricweld pipe mill. Philip Starr, superintendent of the tube division at the Aliquippa works, directs the activities of the new facility.

Baash-Ross Names Zografos As Advertising Manager

E. C. ZOGRAFOS

E. C. Zografos has been appointed manager of advertising and sales promotion for Baash-Ross Tool Co., Houston, according to H. L. Messinger, general sales manager.

Formerly assistant advertising manager for this division of Joy Manufacturing Co., Zografos has been with Baash-Ross since early this year.

Coastal Marine Launches Two New Offshore Vessels

Officials of Coastal Marine Drilling & Construction Corp. of Houston attended recent launching ceremonies for two of the firm's new offshore vessels at the Camden, N. J., yard of the New York Shipbuilding Co.

The 2,500-ton "Howard E. Cole, Jr.," an ocean-going drill platform tender incorporates a full-sized helicopter landing deck and a gigantic 60-ton crane. It was named for H. S. Cole, Jr., president of Coastal Marine.

The "Irwin Alcorn," a 276-ton cargo vessel for offshore petroleum operations, was named for the firm's executive vice president. The two vessels will be commissioned in Beaumont and put in service in the Gulf.

Gaudin Joins Delta Tank's Sales at Lafayette Branch

Robert S. Gaudin has been appointed a sales engineer in Delta Tank Manufacturing Co., Inc.'s, oil-field equipment division, according to Ross B. Baze, vice president.

Gaudin has been assigned to Delta's Lafayette, La., branch. He formerly was in the production department of Humble Oil & Refining Co. and Warren Petroleum Co.

Today, more than ever before in history, oil is a vital commodity of freedom. And the tanker that carries oil is truly a citadel of freedom.

Above, you see such a vessel . . . one of several new Cities Service tankers incorporating the latest in design, efficiency and speed. And Cities Service is building still newer tankers to keep not abreast, but ahead of the constantly growing demand for these magnificent work horses of the petroleum industry.

These ships are designed to carry oil to ports all over the world. Designed to transport twice the oil of former tankers . . . with each one capable of carrying enough fuel oil to heat 15,500 homes for a year! And, designed to load, travel and unload at amazing speeds, too. For today, it is clear that speed of delivery can be as important as the oil cargo itself.

But, before this mighty fleet can travel at all, its cargo of oil must be found and produced. Thus, in the arctic tundra, in deserts, bayous, offshore waters, and oil fertile valleys throughout the world, Cities Service is now pushing forward the greatest oil search in its history . . . planning to find more oil in the next few years than in its entire history of nearly a half-century!

Finding and delivering more oil is part of a giant expansion program which will enable Cities Service to continue contributing toward a better world for all.

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A $45 Mission Piston could, in this case, have helped the driller avoid the wash-out that destroyed this $175 liner. With many other pistons, a leak often starts gradually and severe liner damage like that shown above can occur before the pressure drop warns the driller.

Mission Pistons feature rubbers with a fabric backing that assures long, leak-free service. Once a leak starts, however, the fabric back fails and causes a quick pressure drop which warns the driller to stop the pump before liner damage can occur. Mission Pistons are dependable and economical. When you remember

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that they also protect liners, you see why far more Mission Pistons are used than all other makes combined. Get them from your supply store.

Here is an extreme example of failure of a competitive piston. Notice the groove made by gradually progressive wash cutting that permitted severe liner damage.

This worn Mission Piston Rubber has failed at the fabric back. This typical failure causes a quick pressure drop which warns the driller before liner damage occurs.

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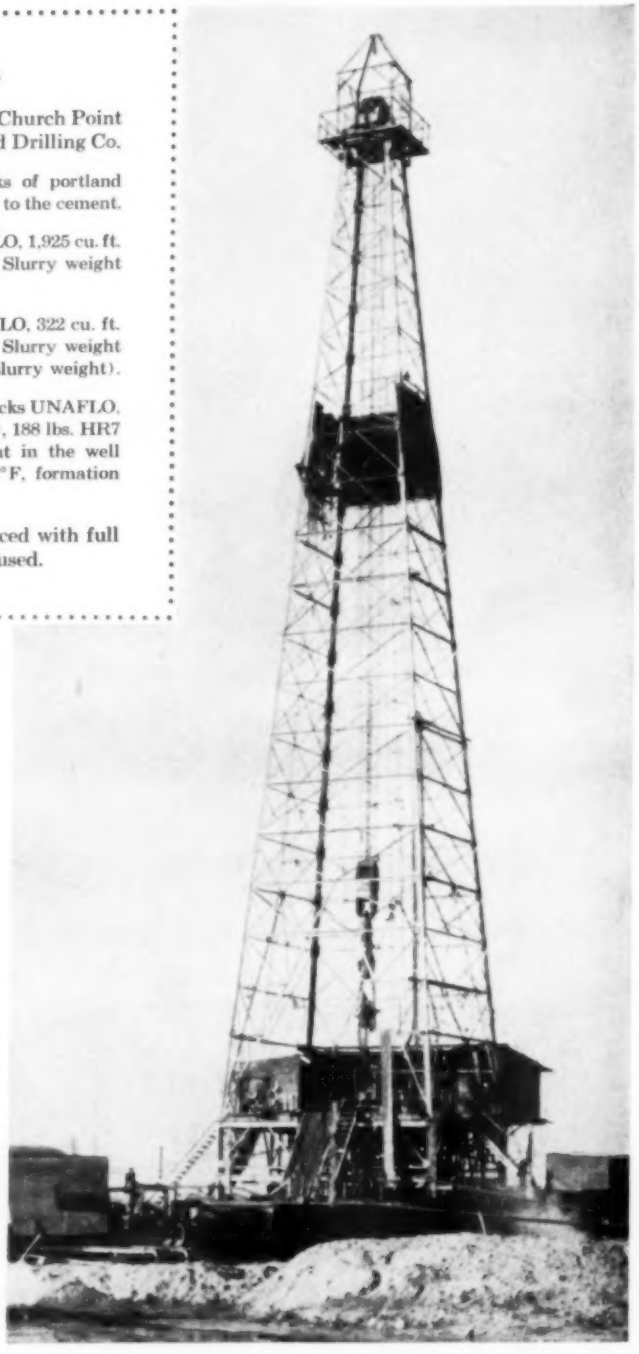
1. 20" conductor pipe cemented at 540' with 372 sacks of portland cement, 372 cu. ft. Strata-Crete No. 6, and 4% gel added to the cement.
2. 13⅜" casing cemented at 4,990' with 1,925 sacks UNAFLO, 1,925 cu. ft. Strata-Crete No. 6, and 4% gel added to the cement. Slurry weight 13.4 lbs. per gal. Mud weight 10 lbs. per gal.
3. 9⅝" casing cemented at 12,917' with 1,610 sacks UNAFLO, 322 cu. ft. Strata-Crete No. 6, and 2% gel added to the cement. Slurry weight 15 lbs. per gal. Mud weight 15 lbs. per gal. (same as slurry weight).
4. 7" 38# RB4-P110 casing cemented at 14,488' with 665 sacks UNAFLO, 332 sacks Halliburton Hidense (Barite weight material), 188 lbs. HR7 retarder. Slurry weight 17.9 lbs. per gal. Mud weight in the well 18.1 lbs. per gal. Bottom-hole static temperature 280°F, formation pressure 12.395 psi.

Lightweight slurry cements used in Jobs 1 and 2 placed with full returns, giving calculated fillup for volume of slurry used.



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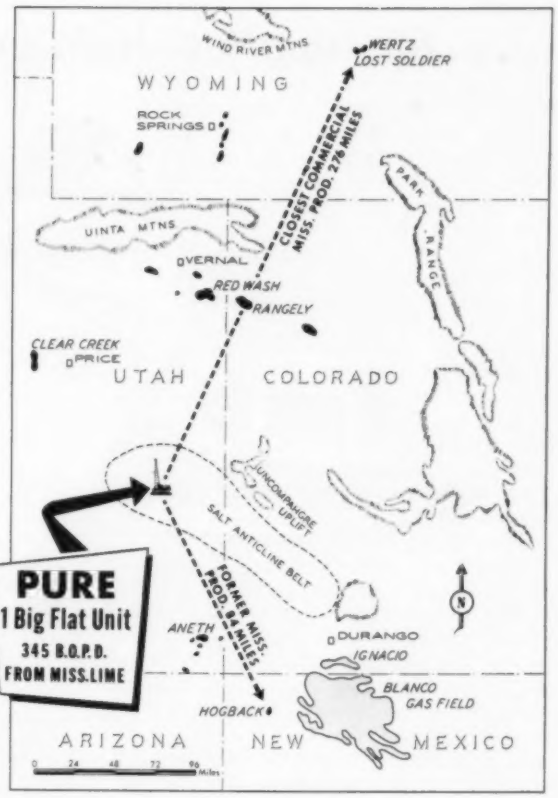
Mississippian Oil Comes to Utah

by Norman S. Morrisey
Drilling-Development Editor



FIRST commercial production from Mississippian rocks appears assured for Utah. Pure Oil Co. is currently completing this important wildcat; the new pool is 276 miles from the nearest oil field producing from rocks of the same age.

IT'S A LONG haul between oil fields in the Four Corners, but even Utah oil finders are amazed at the distance between Mississippian oil fields. Big Flat stands alone in Grand County, Utah, the only Mississippian oil field in the state. Closest commercial production is at Lost Soldier field in Wyoming, 276 miles to the northeast. Hogback field in the San Juan basin of Northwest New Mexico has produced minor amounts of Mississippian oil.

Pure Oil Co. is currently completing a Mississippian producer at Big Flat, the 1 Unit (SW SE 14-26s-19e). On initial tests, the well has produced at rates up to 345 bbl. per day after acid treatment from perforated interval 7,694-7,728 ft. The oil is 43°-gravity sour crude.

Actually, the 1 Unit is not the first Mississippian oil at Big Flat. King Oil Co. completed a marginal well from this zone in 1955, but the Pure well appears to be the first commercial Mississippian well for the State of Utah. What is more important, it extends production from Mississippian rocks into a virgin territory, the Paradox basin. Now Mississippian production extends from Alberta southward across Montana, North Dakota, Wyoming, and into Utah, a chain of oil fields 1,000 miles long. The Mississippian is a potential pay zone in an area embracing 300,000 sq. miles.

What controls production? . . . Big Flat is a known surface anticline, and like so many Mississippian oil fields, this new production is related to structure. Mississippian oil fields can be lush producers. Elk Basin, that lies athwart the Wyoming-Montana state line, will ultimately produce 30,000,000 bbl. of Mississippian oil. And of course geologists and engineers are only too happy to point out the Nesson anticline in North Dakota with reserves of 219,000,000 bbl. from the Mississippian Madison. Admittedly, these are the cream of the Mississippian oil fields but even the smaller fields are well worth having in your stable of producing properties.

Invariably Mississippian rocks are uniform in lithology, and where there is one oil field, you can expect more in the same general area. Wells that have penetrated the Mississippian in Utah are few, but the majority of them have logged shows of oil or gas in this zone. The limestones and dolomites are usually porous and should be excellent reservoir rocks. Drill-stem tests of the zones recover large quantities of salt water, probably indicating that any Mississippian oil field will have an active water drive.

Salt structures . . . Big Flat lies along the northwest rim of the Paradox basin in an area that is relatively unexplored. The field lies along the northwest extension of the Paradox fold and fault belt. In this zone, just southwest of the Uncompahgre uplift, are many large surface anticlines, some of them almost regional in extent. These anticlines are the result of of salt movement and undoubtedly many are faulted. Most of the deep tests are located on the crests of the surface features and only a handful of wells have actually penetrated the Mississippian. Gulf Coast geologists know that the crest of a salt structure can be a poor spot to look for oil. They play the flanks where accumulation is related to faulting. This approach might be applied to these "barren salt anticlines" of Utah and Colorado.

North Louisiana geologists, too, will admit that the crest of a structure can be a poor spot to look for oil. They point to many of the dry Smackover tests that were drilled right on top of known Cretaceous structures. The results of this exploration campaign were most discouraging until an astute oil finder recommended a flank test. This change in approach resulted in the finding of seven new Smackover fields in rapid succession, all flank producers on a known trend.

Will the same approach prove successful in finding Mississippian oil in Utah and Colorado? There is only one way to find out and that is to drill. We do know that the Mississippian is now a pay zone for Utah, and this pay zone covers a wide area. This reservoir is draped over many known structures. It will remain for the petroleum geologist to unravel the mysteries of the salt anticlines and the Mississippian stratigraphy. The result will be more new oil fields. Who knows, the Pure 1 Big Flat Unit may be Utah's answer to North Dakota's 1 Clarence Iverson.

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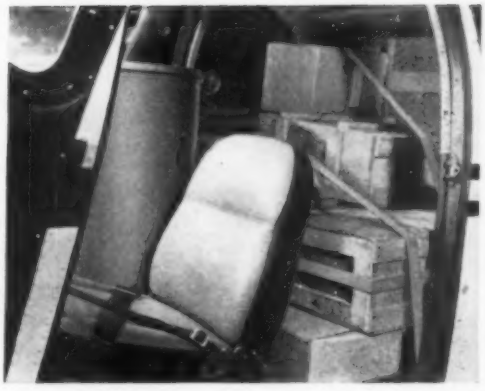

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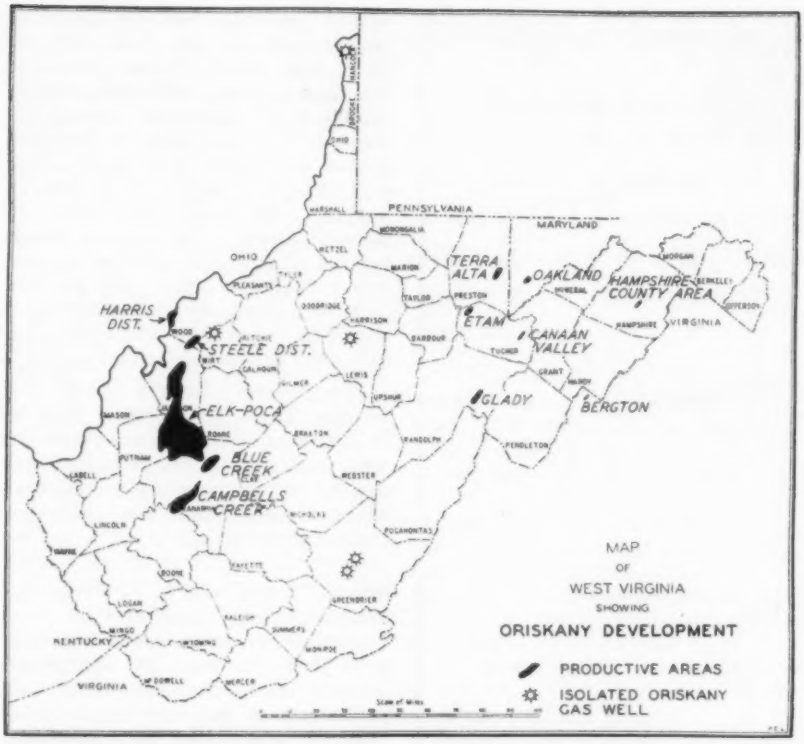


ORISKANY PRODUCTION in West Virginia occurs in two different settings. In the Elk-Poca area, the Oriskany is essentially flat and stratigraphy plays an important role in trapping gas. Gas production in the northeastern part of the state is associated with strongly folded anticlines. Fig. 1.

Oriskany Looks Promising In Eastern West Virginia

By P. H. Price, R. C. Tucker, and Oscar Haught

THE ORISKANY SAND has been one of the most productive in West Virginia. Formations below it have produced very little gas.

Many dry holes have been drilled into the Oriskany in various parts of West Virginia, but we believe that many areas of profitable production still remain to be found, especially in the east, where the formation lies in strong folds or fault blocks. Here, the results of recent drilling in Preston, Hampshire, Tucker, Randolph, and Greenbrier counties show that the structure at depth differs considerably from that evident in exposed rocks. Selection of a favorable location for an exploratory well is therefore a very difficult problem, unless knowledge of the surface geology can be supplemented with accurate geophysical data. The Oriskany of this region is almost certainly cut into blocks by faults which often are not apparent at the surface. Hence, the results of an isolated exploratory well cannot be regarded as a test for more than a very small area, nor may safe conclusions as to structure be drawn from one well.

Authors are: Paul H. Price, director and state geologist, West Virginia Geological Survey; Rietz C. Tucker, assistant state geologist; and Oscar Haught, petroleum geologist. Paper presented at the A.P.I. Eastern District Meeting, Pittsburgh, under the original title, "The Results of Deep Drilling and Future Prospects in West Virginia."

Character of Oriskany Sand Reservoirs

In West Virginia, the Oriskany sand is a very extensive sheet of calcite-cemented sandstone. It immediately underlies some 80 to 225 ft. of chert and cherty limestone (Huntersville), and rests upon 100 to 500 ft. of Helderberg beds, mainly limestones. In a few of the northeastern counties of the state, the chert (Huntersville) immediately overlying the Oriskany is replaced by a shale (Needmore).

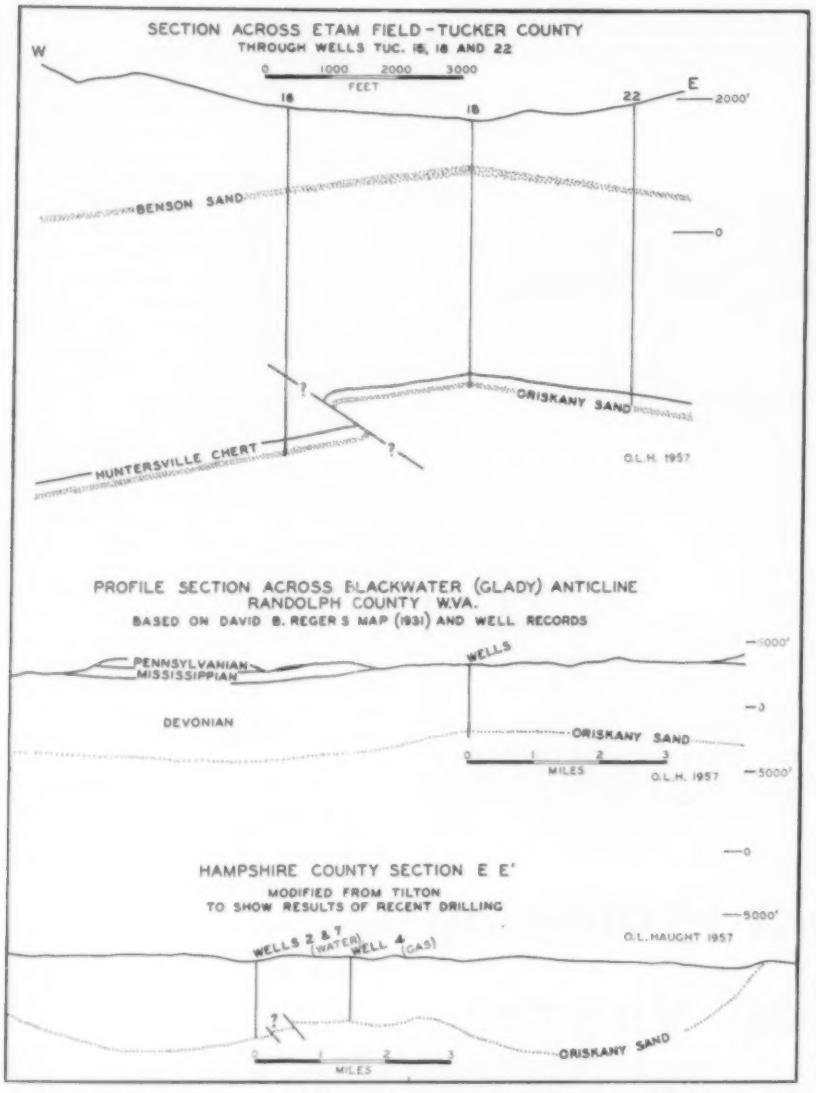
The productive areas of Oriskany in West Virginia are of two quite distinct types. In those areas located in the region of nearly horizontal bedding, to the west of the strong Appalachian folds, production depends upon intergranular porosity and permeability. The gas-filled zones overlie inactive salt water, and are bounded otherwise, especially on the west, up the regional dip, by increasingly impermeable Oriskany. Such fields produce wet gas, usually associated with a little oil. The productive Oriskany gas fields in Ohio have been of this general type. In West Virginia, they include the large Elk-Poca field in Kanawha, Jackson, and Putnam counties, also several smaller productive areas in the same region. Elk-Poca field has produced more gas than all other Oriskany fields in West Virginia combined.

Production from the Oriskany of the strong folds found in the eastern half of West Virginia consists of dry gas, and is not associated with oil. In some fields, production appears to depend upon fracture permeability, developed in an originally almost impermeable calcareous sandstone of low porosity. Productive areas developed in West Virginia have been small, although a new one lately discovered on the Blackwater (Glady) anticline in Randolph County may prove quite large.

Elk-Poca area . . . The first Oriskany gas well in Kanawha County was drilled in 1930, but development did not become very active until 1934-35, after the first—and almost the only—Oriskany oil well had been completed. During the next 10 years some 1,000 Oriskany gas wells were drilled in this field. Drilling gradually slackened after 1945, and had practically ceased by 1954.

The Oriskany of this area consists of two permeable zones, separated by a few feet of lime, in all probability tightly cemented impermeable calcareous sandstone. Nearly all production has come from the upper permeable zone, which may reach a thickness of as much as 50 ft. Numerous wells of this field produced large amounts of distillate, as much as 25,000 gal. per day from each of a few wells.

Elk-Poca field is the middle, and by far the largest, of five separate but neighboring areas of Oriskany production located in Kanawha, Jackson, Putnam, and Wood counties. It extends northward from near Charleston almost to the northern boundary of Jackson County. Southeast of this field, from which it is separated by a poorly defined unproductive zone about a mile wide, is Blue Creek field, in Elk and



STRUCTURE plays a dominant role in trapping gas in the Oriskany sand in the Blackwater and Etam fields. Recent tests in Hampshire County (lowest section) produce gas in the bottom of a surface syncline. Fig. 2.

Big Sandy districts of Kanawha County, with a productive area of some 15,000 acres.

Since 1949, 22 wells (including 4 dry holes) have been completed in this field, with a total reported initial open-flow production of 77,680 M.c.f. per day, or 4,315 M.c.f. per productive well.

Campbells Creek-Boone County field is located directly south of Elk-Poca field. It is a large, though poorly defined and not very productive, area and extends south for a short distance into Boone County. Near its southern end are two small Oriskany oil wells, drilled in 1945 and 1954, with initial productions of only 4½ and 10 bbl. per day respectively.

McClain (1949) states that the total production, to January 1, 1948, of the three fields just described was 721,482 M.M.c.f. from an estimated total ultimate recovery of 910,000 M.M.c.f. He gives the total productive acreage as 193,000, which has probably been somewhat increased through drilling since that date.

Two small areas of productive Oriskany have been found in Wood County, north and northwest of the main Elk-Poca field. The first discovered of these is in Steele district, directly north of Elk-Poca field. Development began here in 1947, and was complete by 1954. The productive area is about 2,500 acres. Now this field is being converted into a storage area, for which it seems well adapted, since it is a well-defined area of very permeable Oriskany sandstone.

A moderately productive Oriskany field has more recently been developed in Harris district, Wood County, northwest of the small field just described. Drilling went on here from 1953-55. Of 32 wells drilled, 30 were producers. The total reported initial open flow is 51,000 M.c.f. daily—an average of about 1,700 M.c.f. per well. The productive area seems to be about 3,000 to 3,500 acres, limited on all sides by gradually decreasing permeability of the sand. Depth to the Oriskany ranges from 4,050 to 4,350 ft. The original rock pressure was about 1,600 psi. The wells were practically all fractured upon completion, since most of them showed only small natural productive capacities.

The western boundaries of the Oriskany fields just discussed tend to be indefinite. The permeability of the sand, and with it the productive capacities of wells, gradually decrease westward until wells are no longer profitable.

Strongly folded area . . . Productive areas of strongly folded Oriskany have been much less important in West Virginia than the areas of undeformed Oriskany already described. The earliest production in the state from folded Oriskany was found on the Briery Mountain anticline, at Terra Alta, Preston County.

By 1954, the productive area, about 1,200 acres was completely drilled. Structure was found to be much faulted at depth, and the results of drilling were so erratic that every well could almost be regarded as exploratory. Available records show that 65 wells have been drilled in this area, of which 42 were producers and 23 dry holes. The total reported initial open flow of all the wells was 119,598 M.c.f.d. and original rock pressure was about 2,300 psi. The best well had an initial production of 17 M.M.c.f.d. Average initial production of this field has been 2,848 M.c.f.d. Drilling to the Oriskany is still going on in this neighborhood.

A field is now under development about 15 miles southwest of Terra Alta field, on the Etam anticline, at the western edge of Tucker County. To date completion of eight successful wells has been reported, also two failures, both of which proved to be located off structure. The total reported initial open flow is 31,750 M.c.f.d., an average of almost 4 M.M.c.f. per well. Depths to the Oriskany range, in this area of rugged topography, from 3,927 to 5,120 ft. The rock pressure is about 2,000 psi. The productive area is still undefined, especially on the east, but it seems to be at least 2,000 acres. On the west it is bounded by water-filled Oriskany. Development began here with the completion of the first successful well, in June 1954. One of the off-

structure dry holes had been drilled in 1951.

Canaan Valley field, located on the Blackwater anticline in the eastern part of Tucker County, has been inactive since 1949, probably on account of the high cost of wells in this area, where the depth to the Oriskany is over 8,000 ft. Drilling is unusually difficult here, and the field seems better adapted to the use of rotary tools than to that of cable tools.

The Blackwater (Glady) anticline, in northeastern Randolph County, has proved a productive Oriskany structure. Seven wells have been completed along or close to the surface axis of this anticline, over a distance of 5 miles. All are producers, with a total open-flow capacity of 33,841 M.c.f. daily. The rock pressure is 2,000 psi., and the depth to the Oriskany is from 4,838 to 5,365 ft. The Oriskany is a thick sandstone here—from 164 to 185 ft., as reported in the well records.

The productive area of the Glady structure is still undefined. A reasonable minimum estimate would seem to be about 1,500 acres. No water has been reported in any well so far, and the width of the productive belt is still unknown.

Three wells in Hampshire County, drilled in 1953, 1954, and 1956, have found gas in the Oriskany. The first drilled of these was not actually a success, since its initial production, after fracturing, was only 89 M.c.f. daily. The second and third were much better wells, with production of 1,800 and 400 M.c.f., respectively.

Depths to the Oriskany in the productive wells range from 4,806 to 5,610 ft. The three productive wells are aligned on the apparent strike, within a distance of 2½ miles, yet the recorded altitude of the Oriskany is about 700 ft. lower in the first completed well than in the other two, more successful, wells. An earlier failure, completed in 1952 and located 1½ miles west of producers, found salt water in the Oriskany, at 2,000-ft. lower depth.

So far as surface geology goes, this well is located structurally higher than any of the producers. It seems very probable that the Oriskany of this region lies in a series of fault blocks, of which the two good wells are in one, the poor producer in a second, and the failure in a third.

In the region of essentially horizontal rocks that includes nearly all western West Virginia, an exploratory well may be regarded as a valid test for a larger area. Nevertheless, exploration is still far from complete here, since the average density of Oriskany tests is less than 1 to 100 sq. miles.

Results of deep tests . . .

"Production from sands lower than the Oriskany has never been important in West Virginia . . . the Oriskany has been the goal of almost all the deeper exploratory wells drilled in the state, hence the Lower Paleozoic systems have remained virtually untested. No worthwhile production has yet been found in the Helderberg, nor in the uppermost parts of the Silurian."

Deeper zones . . . Production from sands lower than the Oriskany has never been important in West Virginia, though some production and numerous shows of gas have been reported at many horizons between the Oriskany and the basement. The Oriskany has been the goal of almost all the deeper exploratory wells drilled in the state, hence the Lower Paleozoic systems have remained virtually untested. No worthwhile production has yet been found in the Helderberg, nor in the uppermost parts of the Silurian.

Much of the gas found in formations below the Oriskany, also some from the Corniferous (Huntersville) in Wayne County, contains considerable amounts of hydrogen sulfide, hence is less valuable than the sweet gas of the Oriskany.

The highest sand below the Oriskany that has produced enough gas to be of interest is the Newburg of northern Boone and southern Kanawha counties. In using the term Newburg, we do not wish to imply correlation with any productive formation of another area. Here, the name is applied to a definite body of fine white or gray sandstone, about 20 ft. thick, of which the top lies 750 to 800 ft. below that of the Huntersville chert.

We have records of only five wells producing from this sandstone, all in Peytona district, Boone County. None was very good—the best well had an initial production of only 200 M.c.f.d. The sandstone seems to be restricted to a rather small area, since its presence has not been noted in many wells drilled past its horizon.

The Keefer sandstone, presumably correlating with the Big Six sand of Kentucky, is much more extensive than the Newburg, as it is recognizably present in almost every well in West Virginia that has been drilled to its horizon. Unlike the Big Six, which is rather coarse-grained, even pebbly, the Keefer of this state is a fine, more or less dolomitic sandstone, about 20 to 50 ft. thick. Stratigraphically, it is located practically at the top of the Clinton division of the Silurian.

Only a few wells, all located in Wayne County, have reported production from the Keefer. At most points in southwestern West Virginia, this sandstone is probably too tightly cemented to be productive. Farther north and northeast, not many wells have reached its horizon.

The Clinton sand is the Tuscarora or White Medina sandstone, at the base of the Silurian. It has been found, usually as fine hard sandstone interbedded with similar siltstone, in every well in West Virginia that has reached its horizon. Production has been found in only a few wells, located in Kanawha, Boone, and Wayne counties. The greatest recorded initial productions are slightly under 1 M.M.c.f.d.

Prospects for finding commercially producible gas in the Silurian of West Virginia are reasonably good. The presence of sandstones is almost certain at the Keefer and Tuscarora horizons, and quite possible in the general zone of the Newburg. The permeability of these sandstones will depend mainly upon the degree to which they are cemented. Gas may accumulate quite early in a bed of sandy sediment, before much lithification has taken place. If such gas remains trapped in the rock, it will prevent further local cementation and will be sealed in all the more effectively through the compaction and more complete lithification of the enclosing sediments. A well might be drilled quite close to such an accumulation of gas without finding it.

Red beds . . . The Ordovician and Cambrian systems are still virtually untested in West Virginia, as only three deep wells, all located towards the southwest of the state, have been drilled past the zone of Juniata (Queenston) red beds at the top of the Ordovician. A few relatively shallow wells have also been drilled, at various times, in the greatly disturbed Ordovician of eastern West Virginia.

The earliest drilled of the three deep wells mentioned was the J. W. Heinzman well, located in Curtis district, Roane County, which was drilled about

1930-31, by United Fuel Gas Co. This well reached a depth of 9,104 ft. According to Dr. J. H. C. Martens, who studied the samples, the well was drilled through the Queenston red shales and siltstones (505 ft.), the Martinsburg shale (1,145 ft.), and penetrated 139 ft. into the Middle Ordovician Trenton limestones. No oil nor gas was reported from any horizon below the Tuscarora.

The second of the deep wells is the 42 F. H. Caldwell, also drilled by United Fuel Gas. This well is located towards the southern end of Wayne County, in Lincoln district. It was drilled during 1947-49, and reached a total depth of 7,900 ft., at which it had penetrated 736 ft. into the Knox, and was probably about 1,200 ft. below the unconformity at the top of the Lower Ordovician. Shows of gas and oil were recorded in the Trenton at depths between 6,359 and 6,543 ft., also a show of gas in a sandstone at 6,615 ft. Several measurable flows of gas, apparently totaling about 100 M.c.f.d. were recorded in the Knox. Almost at the bottom of the hole, a strong flow of salt water seems to have been encountered. The record is not entirely clear.

The latest of the deep wells is, of course, that located on the Power Oil Co. tract in Wood County, which was drilled to basement by Hope Natural Gas Co., during 1954-55. The well is located on the surface trace of the axis of the Volcano-Burning Springs structure. Intensely deformed, probably thrust faulted, lower Devonian beds were penetrated between 4,000 and 6,200 ft. Below this, the well was drilled through gently dipping Lower Paleozoic rocks and into gneiss, encountered at a depth of 13,275 ft.

The Tuscarora (Clinton) was found at 7,679 to 7,811-ft. depth, consisted mainly of fine hard sandstone and siltstone, and gave but one slight show of oil and gas. Below this, the section consisted largely of dolomite, but with many sandy and argillaceous zones. Many shows of gas were recorded, especially in the interval between the top of the Trenton, at 9,528 ft., and basement. The oldest Paleozoic present here, resting immediately upon the basement, seems to be of late Cambrian age. This well was drilled with rotary tools, and considerable difficulty sems to have been encountered in testing adequately the lower zones of gas shows.

Structural Features

The main structural feature of this region is a synclinal zone about 12 miles wide, on each margin of which the Oriskany outcrops in long narrow and complex anticlinal belts. The producers are located about 6 miles southeast of Romney, near the middle of the synclinal zone. The size of the productive area is totally uncertain. Because the main production appears to come from a fault block, it may prove limited to a very narrow strip. The main synclinal zone itself is large enough to contain several productive areas and very few wells have been drilled in it. The production found here is especially interesting, as it is the first found in this state to the east of the main outcrop zone of the Oriskany. It is similar in its geographic location to the Bergton, Rockingham County, Virginia field. **End.**

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Rocky Mountains	362
Texas	362
Washington	366
Wildcats	366

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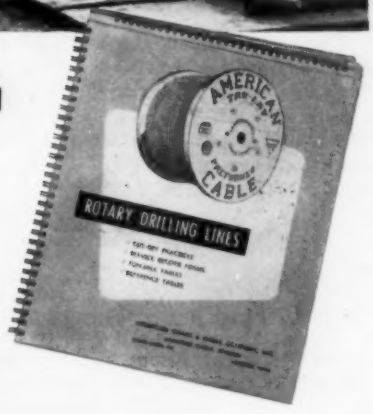

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EXPLORATION HIGHLIGHTS

APPALACHIAN

OHIO

Oil-Gas Well Found Northwest of New Castle

Smith Petroleum Co. moved out nearly a mile to the northwest of production in New Castle Township, Coshocton County, and brought in a combination well on 1 A. J. Stricker, 2nd Qr. The Clinton was logged at 3,194-3,228 ft. and gaged 1,000,000 cu. ft. and 25 bbl. in 24 hours after fracture.

Good Oil Producer Brought in at Marne

Along the east edge of the Marne pool in Madison Township, Licking County, Licking Development Co. completed a 200-bbl. well on 1 John Mansberger, Lot 8. Clinton at 2,626-52 ft. had a 5-bbl. showing before fracture.

Second Try Bags Gas Well in Medina Area

A second attempt to open a gas pool in Wadsworth Township, Medina County, resulted in a 1,300,000-cu. ft. well on 2 L. Kollert, Lot 8. Clinton was found at 3,421-32 ft. with a fair showing natural.

PENNSYLVANIA

Armstrong Township Test Finds Gas in Chert

Chert gas was found at 7,362 ft. at the Armstrong Township wildcat in Indiana County by James Drilling Co. 1 August Stase. The well gaged 4,106 M.c.f. of gas per day after fracturing. Rock pressure was 2,900 psi. in 48 hours. Total depth is 7,590 ft.

WEST VIRGINIA

Gore District Wildcat Fails to Find Production

In Gore district, Hampshire County, Columbian Carbon Co. 1-1228 Lonza Kidwell, was dry after unsuccessful fracturing. Total depth is 5,859 ft.

Drilling Under Way at Deep Union Wildcat

In Union district, Tyler County, Clifford L. Sayre is drilling in a deep wildcat test. It is the 1 Earl & Rosalene Wells, elevation 645 ft., St. Marys Quadrangle, 3 miles south of latitude 39 degrees 30 minutes and 0.65 mile west of longitude 81 degrees .05 minutes.

CALIFORNIA

Union, Shell Miss With Ventura County Wildcats

Two closely watched wildcats in Ventura County were abandoned last week after failing to turn up anything encouraging.

Union Oil Co. gave up on 1 Hobson located about ¾-mile north of the main Rincon area near Red Mountain after two redrill jobs. The hole was originally taken to 9,500 ft. and then plugged back twice for redrilling to 7,581 ft. and 6,685 ft.

The other unsuccessful wildcat was Shell Oil Co. 1 Shell-Sunray USL drilled about 1½-miles east of Shiells Canyon field. It was taken to 10,034 ft., before Shell threw in the towel.

Trico Scores in Belgian Anticline

Trico Oil & Gas Co. scored a new pool discovery on the southwest flank of the Belgian anticline in Kern County. The wildcat, 51-25 Veon, was completed in an interval at 5,548-5,633 ft. for 144 bbl. daily of 36°-gravity crude, with a 17/64-in. choke.

Texaco Completes Important Oxnard Field Extension

The Texas Co. extended production in its Oxnard field, Livingston pool fault block discovery of last March more than ¼-mile west with completion of 2 Scholle-Livingston in NE NE 6-1n-21w. This is on the southwest edge of the Oxnard field in Ventura County. The well was brought in flowing 32 bbl. of clean oil the first hour on production from two intervals at 7,824-8,034 ft. and 8,072-8,271 ft. Total depth is 8,892 ft.

CANADA

ALBERTA

East Calgary Area Adds Another Wet Gas Strike

Another wet-gas discovery has been recorded by Jefferson Lake Sulphur Co. of Tulsa, who is currently carrying out an exploration program in the East Calgary area of Alberta. The newest success was indicated when drill-stem test in the basal Blairmore formation flowed gas at a rate of 4,300,000 cu. ft. daily and gave up approximately 40 bbl. of condensate during the 8 hours the valve was open. It will be remembered that this same firm struck distillate-bearing gas at another well in this area a short time ago, however, that discovery was made in the Mississippian horizon. That zone was not developed at this new hole which lies 2 miles east and slightly north of the previous success.

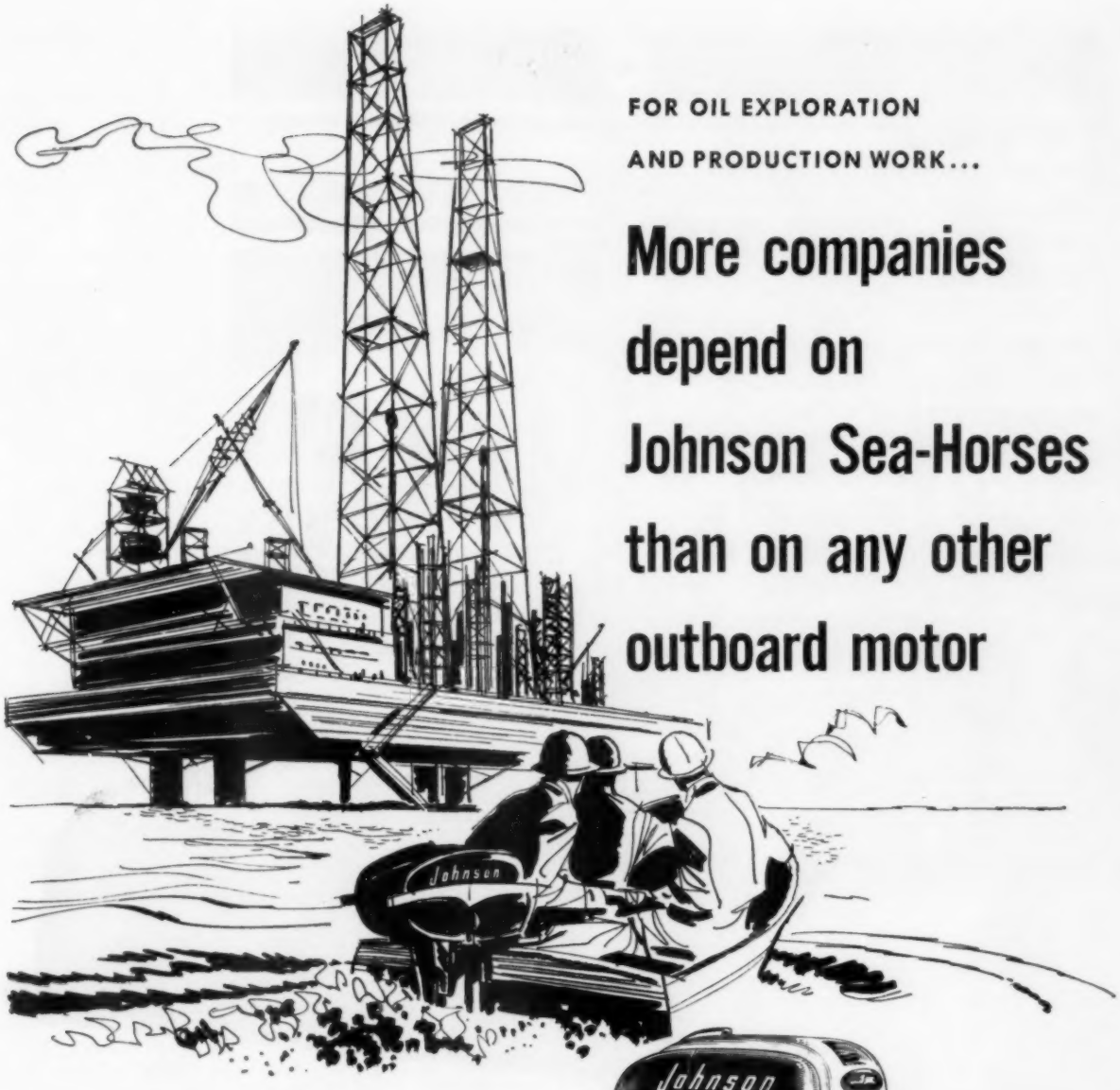
This new strike, Jefferson Lake-C.P.R. 25-11 Calgary, on LSD 11, 25-25-29w4, is the third venture for the firm in the area which was originally designed to prove up sufficient sulfur bearing gas reserves in the D1 zone of Devonian to warrant construction of a sulfur extraction plant. Both of the previous tests were successful in that zone as well and the new discovery is also being carried down to test that zone's productivity. It lies 4 miles northeast of Calgary's city limits and is 2 miles east and a little north of the 27-6 well which flowed gas from the Mississippian at the very high rate of 123,000,000 cu. ft. daily as well as giving up 20 bbl. of condensate per million cubic feet of gas. The drilling program is being carried out on Mobil Oil of Canada, Ltd, farmout rights of which 80,000 acres are committed to the sulfur company.

Important Viking Discovery Reported Near Garrington

A four-company team that has been active for some time in exploration of the Garrington area of southwestern Alberta, 60 miles north-northwest of Calgary, has confirmed what appears to be an important Viking sand gas and light oil pool in the region. Included in this team are New Superior Oils of Canada, Ltd., General Petroleums of Canada, Ltd., Altex Oils, Ltd., and the operator, Hudson's Bay Oil & Gas Co., Ltd.

The new find was made at the Hudson's Bay-New Superior et al 12-26-34-5 venture on LSD 12, 26-34-5w5. Discovery drill-stem test was a 55-minute evaluation of a 49-ft. interval below 8,045 ft. Three minutes after the tester was opened natural gas reached the surface at a flow rate of 7 million cubic feet daily. Distillate reached the surface in 7 minutes and light oil was apparent by way of a heavy cloud of oil vapor in 50 minutes. When pipe was pulled it was found to contain a 240-ft. column of high 47°-gravity oil.

The well is now heading for its major objective, the Mississippian limestone, expected around 9,000 ft. Drilling is currently proceding below 8,300 ft. Completion procedure will



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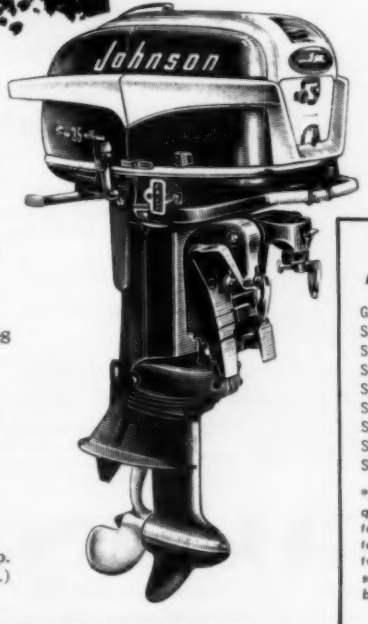

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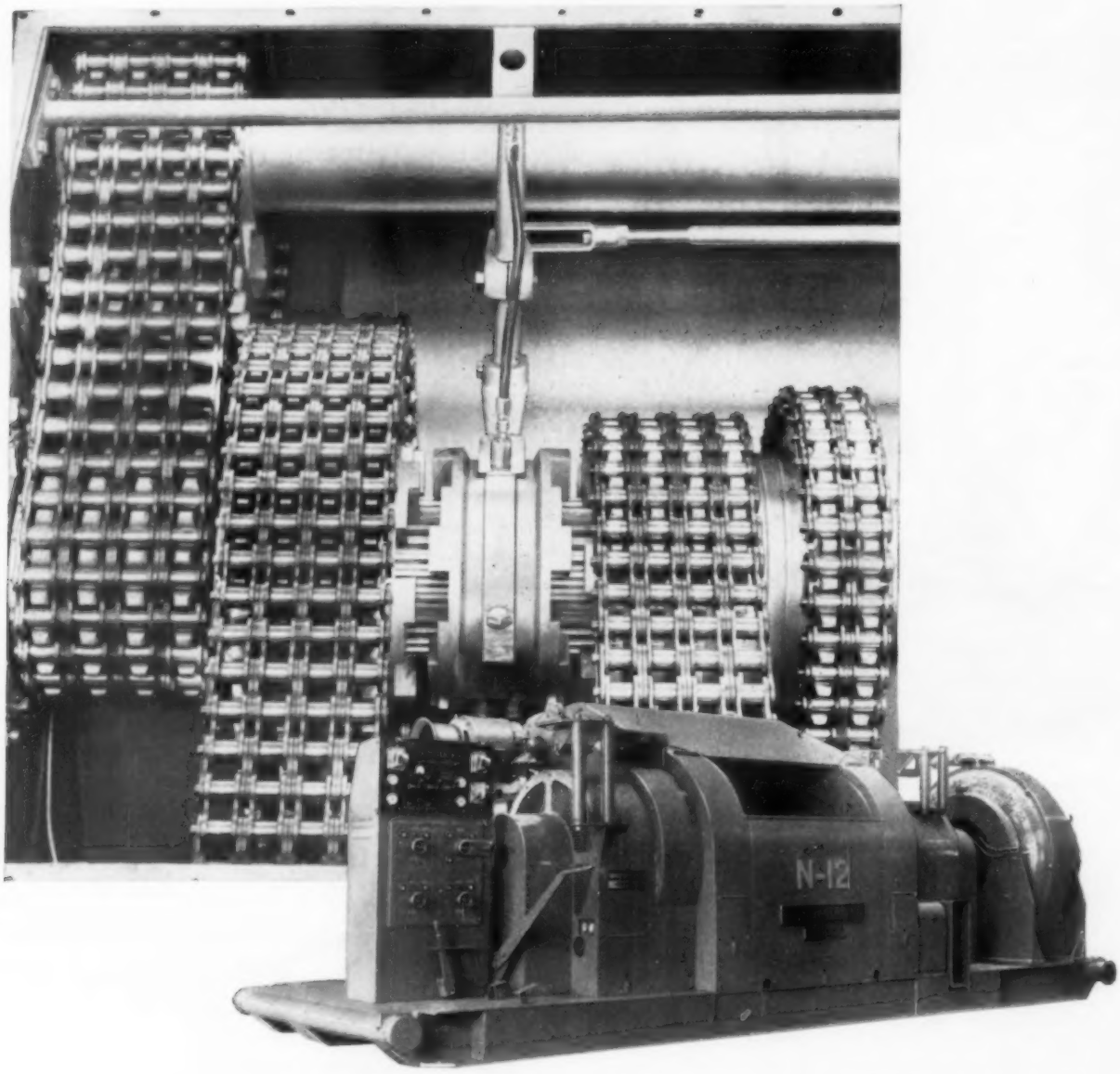

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be determined after the Mississippian has been reached and evaluated

More Pay Tapped at Edith Lake Discovery

The Home et al Regent 11-19 Edith Lake Slave Point oil discovery hole has now opened up 144 ft. of oil pay zone in that sector of the Beaverhill Lake formation and crew is engaged in cutting another core with another 175 ft. of the structure anticipated. Whether or not the remaining footage will be oil bearing remains to be seen but commercial oil production has already been assured as the well has flowed and given up good pipe recoveries of oil during the drill-stem tests so far run which have covered the top 109 ft. of zone. After completion of the current operations, that is expected to be another 35-ft. core, company officials will decide on further testing procedure.

Edith Lake No. 11-19, on LSD 11, 19-67-10w5, lies 6 miles southwest of the Home et al Regent 8-11 Swan Hills Slave Point discovery hole and is some 20 miles northeast of the Home-Union-Hudson's Bay 9-20 Virginia Hills strike which also is productive from the Slave Point horizon.

KANSAS

New Pool Opened in Southwest Harvey Area

A new pool was opened in southwestern Harvey County, south-central Kansas. The discovery well is Ted L. Ferrier 1 Devenpeck, NW NW NE 18-24s-3w, 3½ miles southeast of Burrton pool.

Production tests are under way at the wildcat which recovered 510 ft. of gas, 100 ft. clean oil, and 30 ft. heavily oil-cut mud on a drill-stem test of the Viola lime at 3,910-16 ft.

Cherokee Sand Discovery Indicated in Pawnee

Jones, Shelburne & Farmer, Inc., have an indicated Cherokee-Pennsylvanian discovery at the 1 Merritt wildcat, NE NE NE 35-21s-20w, 8 miles south of Newson pool in Pawnee County.

A drill-stem test at 4,208-25 ft. got 30 ft. of gassy oil, 180 ft. of gas, and 120 ft. of very heavily oil-cut mud. Production tests are due at the strike.

Mississippian Strike Seen At Barber County Test

An eastern Barber County wildcat reported shows of oil and gas in the Mississippian, promising a new pool for the area 1½ miles northwest of Highway field. The indicated discovery is Mull Drilling Co.'s 1 Randels, SE SE SE 9-32s-11w, 3 miles east of Medicine Lodge, Kans.

A drill-stem test at 4,377-91 ft. gaged 1,630 M.c.f. of gas per day, decreasing to 517 M.c.f. later. Recovery was 500 ft. clean gassy oil, 75 ft. slightly muddy oil and no water.

SOUTHWEST

Meade County Strike Flows Chester Oil

Panhandle Eastern Pipe Line Co. 1 Behnke, C SE SW 29-33s-29w, Meade County, is a new pay discovery in the Chester lime of Mississippian age. Production is from perforations at 5,889-94 ft. This zone has had a temporary test, flowing 149 bbl. of oil daily and 1,790 M.c.f. of gas.

In addition to the new zone discovery, the well will also produce from the Morrow - Pennsylvanian sand through perforations at 5,803-08 ft. and 5,782-5,800 ft.

LOUISIANA

NORTH LOUISIANA

Rank Smackover Discovery Completed in Union Parish

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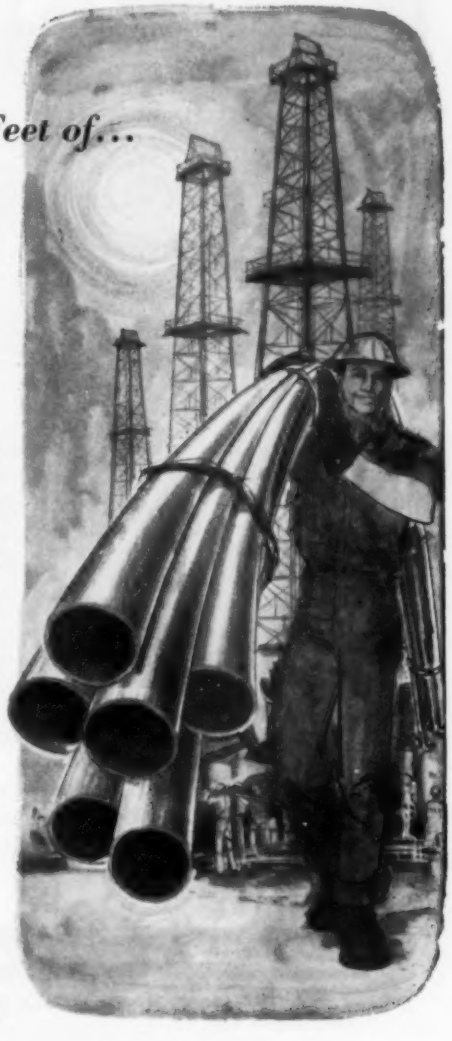

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KP-102

C SW SW 8-20n-1e, Union Parish, as a Smackover oil discovery. Flow was 229 bbl. of 67.8°-gravity oil daily with no water on 11/64-in. choke from perforations in the deep Smackover at 10,354-68 ft.

This is an important discovery in that it lies 14 miles northwest of nearest such production at Bernice field. The new strike opens Farmerville field, 2½ miles south of the town of Farmerville in Union Parish, north-central Louisiana.

SOUTH LOUISIANA

Deeper Oil Production Proved in Reeves Area

Beck Oil Co.'s deep oil-discovery well in the Reeves area, southwestern Allen Parish, produced at the rate of 198 bbl. of 42.1°-gravity oil per day through ⅛-in. choke for its potential gage.

Flow was with gas-oil ratio of 950 cu. ft. per barrel and pressure of 3,100 psi. Its zone is perforated at 10,124-56 ft. with bottom of the hole at 10,457 ft. and casing at 10,405 ft.

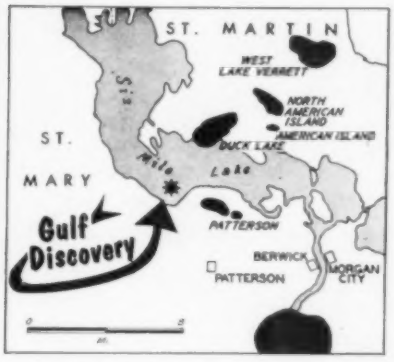
The discovery revives this area which has just one producing well, completed in 1951 in a middle Oligocene at 5,900 ft.

Nearest other production is a lone well, 3½ miles northwest, completed last November by Serio-Punches Oil Co., making 49°-gravity oil from a 10,000-ft. Frio sand. Bunchy Creek field, with two gas wells, is about 4 miles northeast.

Six Mile Lake Wildcat Uncovers New Gas Area

A new gas-condensate field has been discovered in Six Mile Lake, in northern St. Mary Parish.

Its discovery well, drilled by Gulf Oil Corp. with Brewster-Bartle Drilling Co. as contractor, is about 5 miles northwest of Patterson on State Lease 2963. It is near the St. Martin Parish line dividing the lake and about 3 miles southwest of Duck Lake field, in the latter parish.



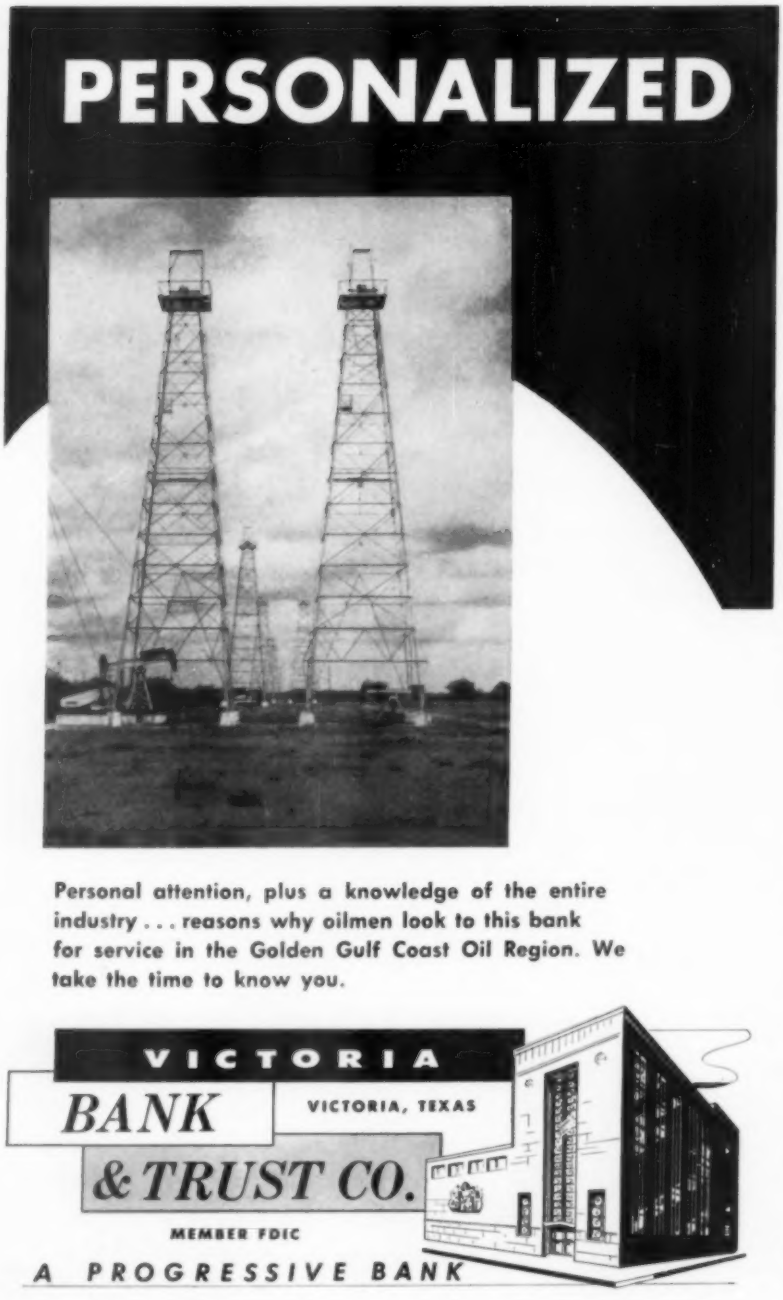
SIX MILE LAKE area on St. Mary-St. Martin parish line where Gulf Oil Corp. has a new gas-condensate discovery (location indicated).

Its producing zone is perforated at 11,370-78 ft. Hole was drilled to 13,917 ft. Initial flow, during a 3-hour test, was at the rate of 4,669,000 cu. ft. of gas and 91 bbl. of condensate per day. It was through ¼-in. choke under pressure of 3,350 psi. Gravity of the condensate is 47.2°.

E. E. Cockrell, Jr., of Houston, is drilling another deep test about a mile north and a little west of Gulf's well. It is on State Lease 2647 with Circle Drilling Co. as contractor. Its permit provides for drilling to 18,500 ft.

Mamou Wildcat Opens New Wilcox Reservoir

Wilcox sand has proved productive of gas and condensate in a wildcat drilled by Humble Oil & Refining Co. about 1½ miles southeast of the east-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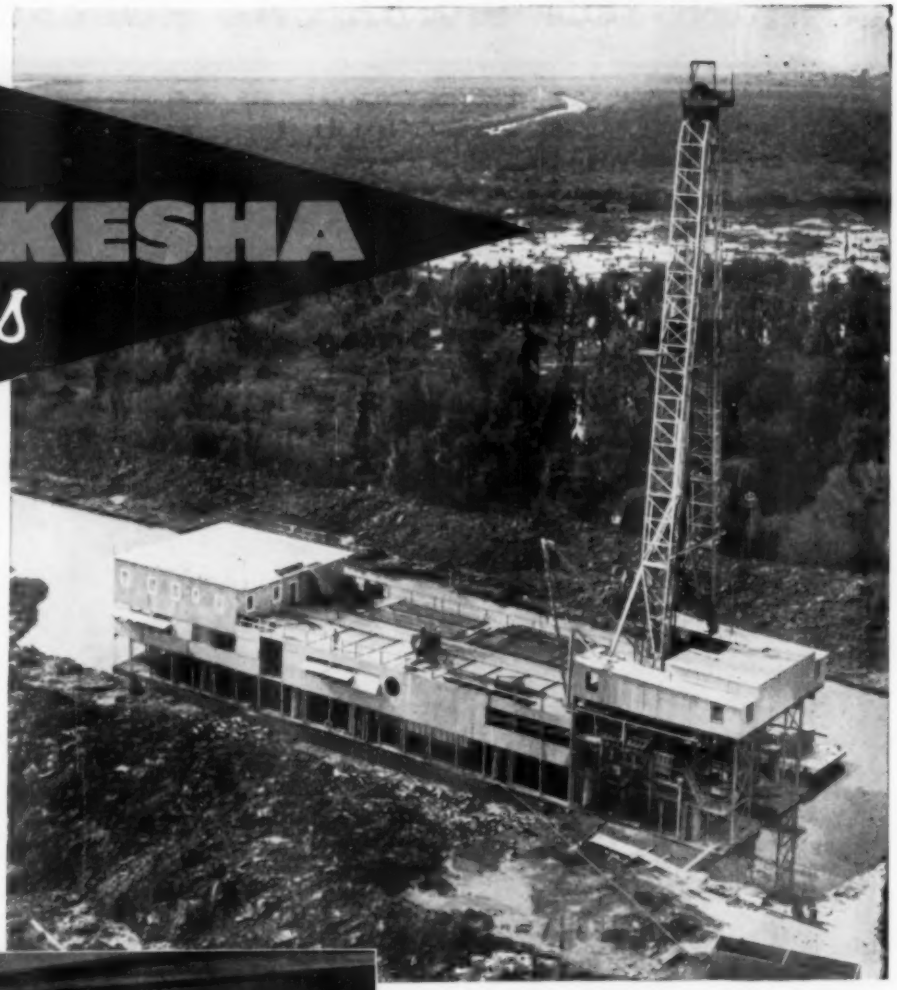

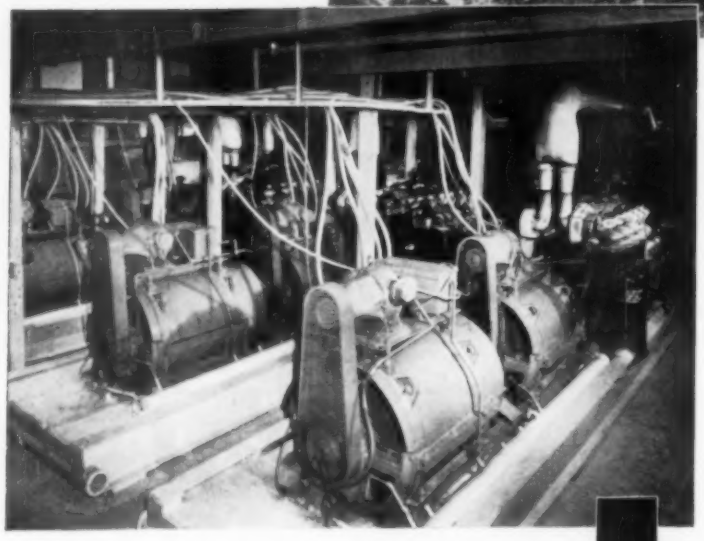

• Circle Drilling Company's 143-ft. Rig No. 6—mounted on their 52 x 220 ft. barge *Kirk C. Lewis* which operates in water to 18 ft. in depth—is one of the world's largest Diesel-electric outfits. Shown here at Week's Island, La., it is drilling a 17,000 ft. well for a major oil company.

Three Waukesha V-12 Diesels—each driving two 540 KW, DC generators—supply power for the Ideco E-2500 drawworks, and rotary; and two Emsco D-1000 slush pumps. These three Waukesha V-12 Diesels are Model VLRDBSU—12-cyl., 8½ x 8½-in., 5788 cu. in., counterbalanced crankshaft—have exhaust driven dual turbochargers for extra power.

Two additional Waukesha Diesels—driving two 200 KW, AC generators—supply power for rig lighting and other auxiliary needs. The mud-mixing pump is an Emsco D-300. These two Waukesha Diesels are Model NKDBSU, 6-cyl., 7 x 8¼-in., 1905 cu. in., turbo-supercharged engines with counterbalanced crankshafts.

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347-R

ern tip of Mamou field, in Evangeline Parish.

Pay zone is perforated at 11,632-41 ft. It flowed at the rate of 1,150,000 cu. ft. of gas and 28 bbl. of 52°-gravity condensate while testing through ⅝-in. choke. Drilled depth was 12,457 ft.

The well is on Humble's Lahaye lease, in 38-5s-1e.

Mamou field, discovered by Magnolia Petroleum Co. in 1945, is oil-productive from 17 wells completed in Wilcox sands from 11,500 to 11,700 ft.

New Deep Field Indicated In White Lake Discovery

Discovery of another deep gas-condensate field, located in the southeastern portion of the large White Lake, in the tidal marsh area of southwestern Vermilion Parish, is indicated in testing by Superior Oil Co. at its 1 State Lease 3,052.

LOCATION of Superior Oil Co.'s indicated deep gas-condensate discovery well in White Lake, southwestern Vermilion Parish.

This test is one of two deep wildcats Superior has been drilling simultaneously on the same lease.

Indicated production in the first test is in a 14,260-ft. Miocene sand, perforated at 14,267-73 ft., with bottom of the hole at 14,567 ft. The well flowed an ungaged volume of gas condensate through 9/32-in. choke with pressure of 3,020 psi.

The prospective field is about 5 miles southwest of East White Lake field, nearest production, and about 8 miles northwest of the large Pecan Island gas-condensate field.

MICHIGAN

Montcalm Wildcat Logs Dundee Pay

McClure and Hartman 1 Austin, 18-11n-9w, Montcalm County, wildcat 6 miles south Reynolds oil field, logged Dundee at 3,182 ft., carried show of oil and gas at 3,264-70 ft, and was abandoned at 3,300 ft., total depth, after picking up water. Same operators will move rig northeast into Section 8. Area was originally under lease to Pure Oil Co. and core drilled.

Trenton Well Stirs Up New Scopio Interest

Clifford A. Perry 1 Hornczi, located in 10-5s-3w, Hillsdale County, flowed at rate of 8 bbl. per hour from Trenton lime to spur increased interest in the Scopio play, where two wells previously were drilled since late 1956

Perry, independent operator, and Aurora Gasoline Co. and McClure Oil Co. control bulk of immediate acreage.

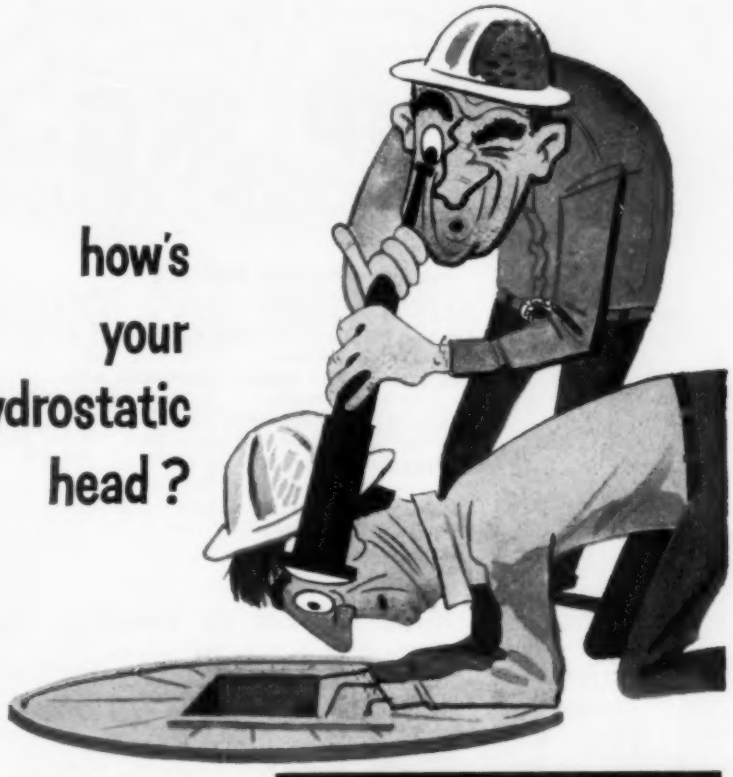
NEW MEXICO

SOUTHEAST NEW MEXICO

Tidewater Gets Second Well in Justice Area

Tidewater Oil Co. has completed its 7 Coates "C" as a big flowing well, in

how's your hydrostatic head?



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(Records mud pit level)

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Lafayette, La. CEnter 5-5313

the Justice-Ellenburger field, east of Jal in Lea County.

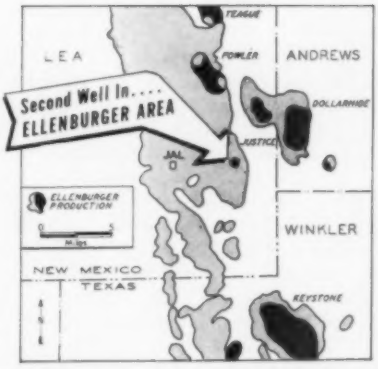
Completion was without acid, for a flowing potential of 1,640 bbl. of 43°-gravity oil a day. Choke was ½-in., and pay section was open hole at 7,937-8,065 ft. Flowing pressure on tubing was 900 psi., and gas-oil ratio was 1,120:1.

Tidewater opened deep production in this old shallow area last June at its 6 Coates, in NW NE 24-25s-37e. Pay was the Ellenburger dolomite at 8,115-45 ft., and potential through ½-in. choke was 1,006 bbl. a day. Elevation was 3,083 ft. Although tops were not reported in the 7 Coates, it apparently ran higher structurally than the discovery. Location of the second well is a south offset to the discovery.

Pennsylvanian Oil Flow In Roosevelt County

Atlantic Refining Co. 1-AE State, in southeastern Roosevelt County, flowed oil while drill-stem testing in the Pennslyvanian.

Location of the wildcat is 6 miles southeast of Milnesand, in NW NW



Tidewater Oil Co. completed its second Ellenburger well in the new area 6 miles east of Jal. The new pay was opened in June of this year.

36-8s-36e. Nearest production is Allison-Pennsylvanian field, 3 miles to the south.

Oil flowed on a test at 9,620-60 ft. Gas surfaced in 4 minutes, mud in 45 and oil in 52 minutes It then tanked 47 bbl. of oil in 1 hour. Choke size was not reported. Flowing pressure ranged from 695-1,300 psi., and 30-minute shut-in. pressure reached 3,270 psi. A test was under way to total depth of 9,671 ft.

Formation tops had not been determined in Atlantic's well. However, a test in the San Andres at 4,916-5,010 ft. indicated possible production. Recovery in 1 hour included gas in drill pipe, 120 ft. of black oil, 50 ft. of heavily oil-cut mud; sulfur water was unloaded when coming out of the hole.

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OKLAHOMA

OKLAHOMA PANHANDLE

Gas Discovery Reported Inside Hugoton Area

Panhandle Eastern Pipe Line Co. 2-32 McClanahan, C NW SE 32-6n-12eCM, Texas County wildcat, gaged 51,600 M.c.f. of gas per day on a blow-down gage and is now waiting pipeline connection.

Production is from perforations at 5,691-5,726 ft. The well is in a separate pay zone, but in the general vicinity of the 3-4 Woodward well in North Richland Center field. This area is on the northwest side of the Oklahoma portion of the Hugoton field near the Kansas line.

Canyon Discovery Indicated in Cimarron

A Canyon lime (Missouri-Pennsylvanian) discovery is indicated in the area 6 miles west of Hugoton field in

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WILLYS MOTORS, INC., TOLEDO 1, OHIO

Cimarron County, 4 miles east of Griggs.

The discovery prospect is The Texas Co. 1 W. D. Youtsler, SW NW SE 23-1n-9eCM. Drill-stem tests in the Canyon(?) at 3,770-89 ft. got 240 M.c.f. of gas per day. Recovery was 1,500 ft. of free oil, 180 ft. of oil and gas-cut mud. A test at 3,353-93 ft. got 490 M.c.f. of gas per day with recovery of 120 ft of heavily gas-cut mud reported. This wildcat will drill on to 5,700 ft.

If the pay zone is labeled Canyon it would be the first such production in Oklahoma. The Canyon is the equivalent of the Missouri series.

NORTHWEST OKLAHOMA

Champlin Will Attempt Woodward Addition

Champlin Refining Co. 1 Obalander, SE SE NW 12-22n-21w, Woodward County wildcat, is being drilled as a confirmation and extension to the 1 McDonald discovery in SE NW 1-22n-21w. That well was a Morrow sand gas-distillate discovery which flowed 9,000 M.c.f. of gas per day and 35 bbl. distillate per million. Perforations were at 8,256-89 ft. The discovery area is immediately south of the city of Woodward.

NORTHERN OKLAHOMA

Big Well Extends Northeast Cherokee Field in Alfalfa

The Northeast Cherokee field in Alfalfa County, northern Oklahoma, was extended to the west by a prolific producer. The newest addition to the fast-growing field is Continental Oil Co. 1 Scribner, C NE NW 25-27n-11w. It flowed 1,042 bbl. of oil per day on 40/64-in. choke from perforations in the Cherokee-basal Pennsylvanian sand at 5,176-5,216 ft.

CENTRAL OKLAHOMA

East Red Mound Pool Confirmed, Extended

Apache Oil Corp. has hit with a producer which confirms and extends the recently opened East Red Mound pool of Lincoln County.

The 1 State BH&G, SE SW NE, 36-16n-3e, is flowing an estimated 20 bbl. an hour from the Red Fork sand at 4,083 ft.

A drill-stem test recovered 640 ft. of oil, 160 ft. of very heavily oil-cut mud and no water. Gas was recovered in 3 minutes, mud in 50 minutes and oil in 53 minutes.

The well is an offset to the pool discovery well completed in August by Mohawk Petroleum Co. and Trend Petroleum, Inc., on a farmout arrangement with Apache.

Apache has 12,800 acres under lease in the immediate area of the well. A 20-acre offset has been staked.

SOUTH-CENTRAL

Two Zone Discovery Indicated Near Norman

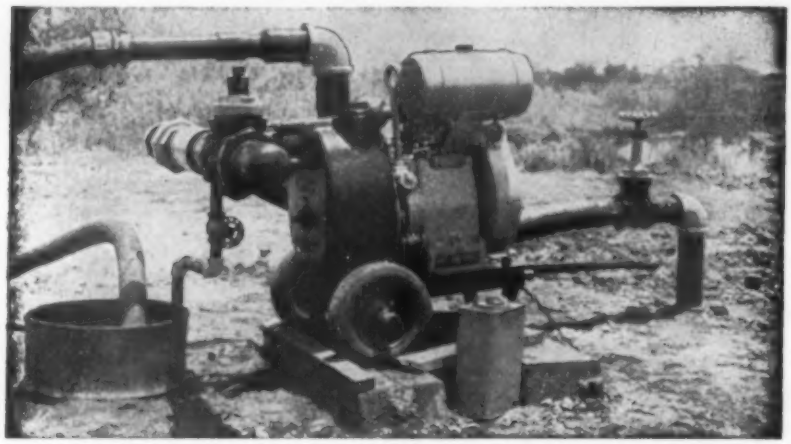
A second Bromide sand and Oil Creek sand Ordovician discovery was indicated last week at Eason Oil Co. and Felmont Oil Corp. 1 Wilcox east of Norman in SE SE NW 35-9n-2w, Cleveland County.

The well flowed an estimated 25 bbl. of oil per hour from 7,714-29 ft. in the second Bromide sand on drill-stem test; and indicated pay at 8,409-66 ft. in the Oil Creek sand.

SOUTHERN

The Sycamore Is New Pay Zone at Southwest Enville

Southwest Enville field in Love County added the Sycamore lime as a pay zone. The new-pay discovery well is The Texas Co. 1 Green, SE NW NE 18-7s-3e. The well flowed 62 bbl. of oil per day on ¼-in. choke from per-



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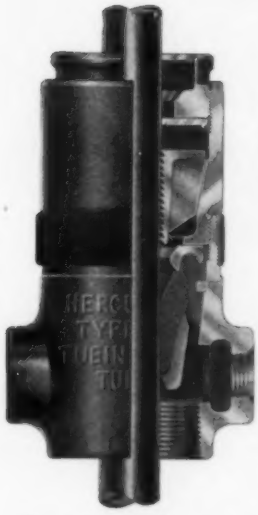

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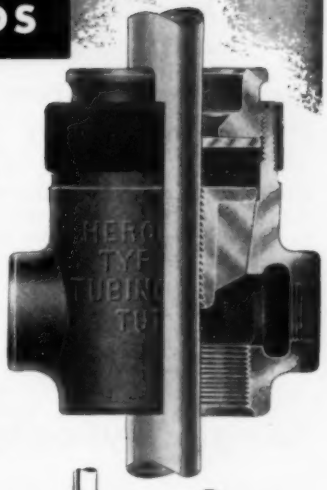

"TYPE J-5-S" STRIPPER TUBING HEAD

The dual purpose "Type J-5-S" Stripper Tubing Head is basically a "Type J-5" Tubing Head with a bowl (top section) screwed into the packing nut thread. The hinged slips, packing and packing nut are installed in the bowl (top section) with the tubing stripper in the body (lower section), thus permitting tubing to be run-in or removed under pressure. Test pressure is the same as the "Type J-5" Tubing Head.

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forations at 2,304-22 and 2,340-2,420 ft. The well made 91 bbl. of oil in 24 hours on ¾-in. choke. Gravity is 43°.

ROCKY MOUNTAINS

NORTH DAKOTA

Completion Due at New Lignite Area Discovery

The Burke County area of North Dakota is due another discovery at Northwest Oil Drilling Co. and Central Le Duc 1 Klitzke, C SW SW 17-163n-91w, 4 miles north of new and booming Lignite field

The operators are waiting on completion tools at the newest Midale-Mississippian discovery in this promising area. Three tests of the Midale zone had oil shows.

The confirmation well to Lignite itself was completed at Northwest 1 Holte, C SE SE 5-162n-91w. Flow was 234 bbl. of oil daily on 9/64-in. choke. Another well in the area, Phillips Petroleum Co. 1 Blom, C NW NW 8-162n-91w, 1½ miles southwest of the field discovery well, has been perforated, casing set, and the operator will acidize. Three other wells in this new field area are drilling.

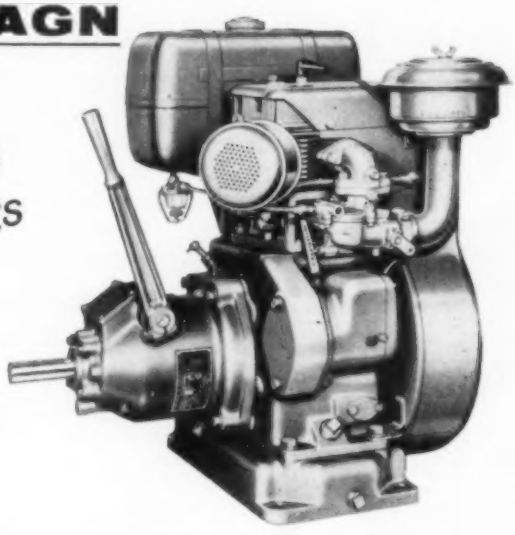
A NEW, BIG, 4-Cycle

Single Cylinder Air-Cooled Engine...

the WISCONSIN 12½ hp.

MODEL AGN

by Engine Specialists



Model AGN Engine with Clutch Assembly. Also available with stub shaft or with Reduction, Clutch Reduction and/or Electric Starting

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Bulletin S-216, just off the press, will give you details about Model AGN. Write for it.

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OREGON

GP Sets Protective String in Oregon Test

General Petroleum Corp. has set a string of 7⅝-in. casing to 6,869 ft. in its Sulphur Springs-Siuslaw area wildcat in Douglas County. GP plans to drill ahead as soon as the cement sets. Depth of the wildcat, 1 Long Bell, was 6,930 ft.

TEXAS

TEXAS PANHANDLE

Roberts County Gets Cherokee Discovery

A Cherokee-Pennsylvanian discovery was completed 15 miles southeast of Spearman by Pan American Petroleum Corp. at 2 E. S. F. Brainard in northwestern Roberts County.

The discovery well flowed 199 bbl. of oil per day from perforations at 7,504-34 ft. Location is 1 mile south of a Morrow oil discovery by the same operator at 1 Brainard. The 2 Brainard is in Section 177, Block C, G&M Survey.

Des Moines Oil Shows At Roberts Wildcat

Recovery of oil from the Des Moines-Pennsylvanian was reported at Pan American's 7-A Lips Ranch wildcat in northwestern Roberts County. This well, 20 miles southeast of Spearman and about 8 miles southwest of Lips field, got its oil on a drill-stem test in the lower part of the Des Moines at 7,817-34 ft. Recovery was 30 ft. of oil, 2 ft. of drilling mud, and 4,500 ft. of gas. Drilling is below 7,869 ft. in lime and shale.

WEST TEXAS

Howard Stepout Flows Reef Oil on DST

Nortex Oil & Gas Corp. 1 C. W. Shafer, an extension attempt 1 mile west of North Vincent (Pennsylvanian) field in northeastern Howard County, reported a flow of oil while drill-stem testing a reef section.

Top of the reef was 7,454 ft. on elevation of 2,373 ft. Amount of flow was not reported, but 43°-gravity oil surfaced in 10 minutes, then flowed into pits for 5 minutes. Recovery was a

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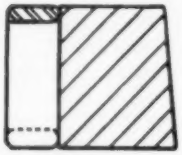

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Pedrick® PISTON RINGS

full string of oil. Drilling was to continue, on an 8,100-ft. contract.

Location of 1 Shafer is SE SE Section 30, Block 25, H&TC Survey. It is 1 mile west of production, and 1¼ miles southwest of a 7,805-ft. dry hole. Vincent and North Vincent fields have production in the upper and lower Canyon, around 7,450 and 7,695 ft.

Scurry County prospect . . . A drill-stem test in Strawn sand recovered 4,900 ft. of clean oil, plus 100 ft. of heavily oil and gas-cut mud, with no water, at W. M. and A. P. Fuller 1 Johnson, 271-2-H&TC Survey, 20 miles northeast of Snyder. Following the 2-hour test, operators ran electrical surveys.

Location of the prospector is 2 miles southeast of the Fuller, Southeast field. This discovery is still a 1-well development, opened last June at Liedtke and Zonne 1 Fuller, for 137 bbl. of oil a day from sand pay at 5,032-36 ft. It is 2½ miles east of the 1-well Fuller, Southeast (Strawn) pool.

Gaines County Extension Flows Devonian Oil

Ashmun & Hilliard and others 1 Peck, located 1½ miles northwest of Devonian production in West Seminole field, Gaines County, kicked off and flowed oil without acid treatment after perforating in the Devonian at 10,554-66 and 10,572-94 ft.

Devonian extension on north side of Seminole, Northwest field.

Flowing through 32/64-in. choke, the well made 52 bbl. of oil in 9 hours. Flowing pressure was not reported. Operators shut the well in to move the rig. Formation markers, on ground elevation of 3,472 ft., were the Woodford at 10,415 ft. and Devonian at 10,515 ft.

Location is in SW SW Section 372, Block G, CCSD&RGNG Survey. Nearest production is from the Wolfcamp, about 1 mile to the southwest.

TEXAS GULF COAST

Dual Wilcox Discovery Indicated at Oakville

Testing is under way at an indicated Wilcox discovery well in the Oakville area, in Central Live Oak County.

The well, drilled by Kirkwood & Morgan, Inc., and Forney & Worrel, got promising gas and condensate showings in a series of open-hole drill-stem tests in two Wilcox sands below 7,000 ft.

Since these tests, hole has been deepened to 7,387 ft. and casing run through the above zones.

Two tests were made in the Slick zone just below 7,000 ft. First took in 5 ft. at 7,013-18 ft. It had working pressure of 500 psi. in 15 minutes through ¼-in. choke and using 1,000 ft. of water cushion. Recovery was 15 ft. of distillate-cut mud, and 850 ft. of heavily gas and condensate-cut water cushion. Bottom-hole pressures were 1,920-2,020 psi., flowing, and 2,680 psi., shut in. Another test of the same zone at 7,018-26 ft. got working pressure of 560 psi. and recovered 10 ft. of condensate and 740 ft. of heavily condensate-cut water cushion.

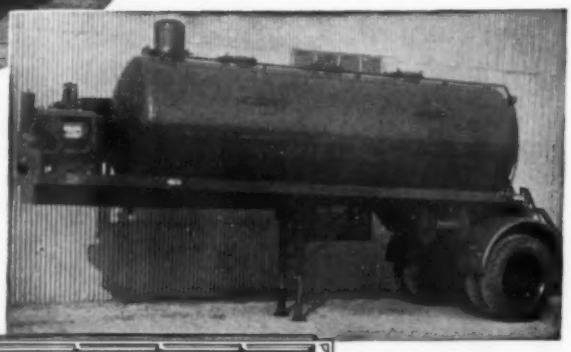
Two tests also were run in the

MOVING DRILLING MUD *FAST!*

Just for the record, this moving job during a changeover was timed, and here are the results: Exactly 8 minutes, 33 seconds after the driver yanked up on the emergency brake, 45 bbls. of 12 lb. mud was snugly inside the Thompson Unitized Vacuum Tank!

TO THE NEXT HOLE

From there to the next hole was discounted as driving time. Starting the stop watch again when the driver had backed up to the shaker pit, the one man laid hose, opened the valve and had the tank empty in 4 minutes 10 seconds.



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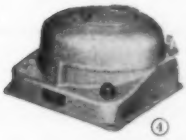

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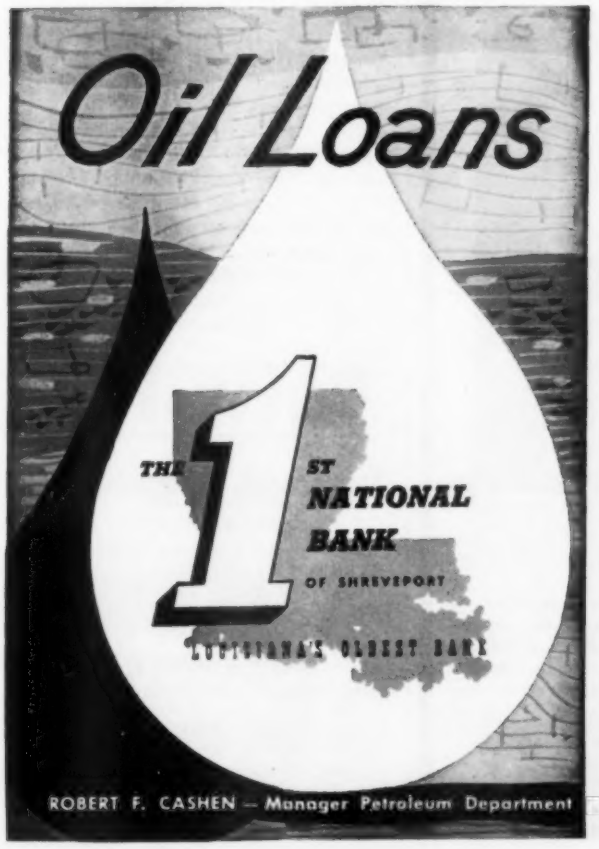

A Schlumberger field engineer checks the log of an electrical survey made at a new well site.

Aeroquip Hose and Reusable Fittings Assure Portable Inventory, Field Installation

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Providing surveying services at the well site calls for equipment that is as dependable as it is portable. That's why Schlumberger Well Surveying Corporation uses Aeroquip Bulk Hose and Reusable Fittings for hydraulic, lube oil and air line replacements on offshore and mobile units.

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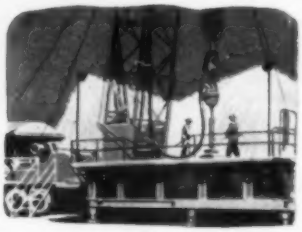

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slightly deeper Luling zone, one at 7,214-20 ft. at the top, and the other at 7,222-32 ft. The first recorded working pressure of 520 psi. in 22 minutes, using ¼-in. chokes. It recovered 1,000 ft. of water cushion, cut with gas and condensate. Bottom-hole pressures were 1,360-1,640 psi., flowing, and 2,820 psi. shut in. The deeper test had working pressure of 59 psi. in 22 minutes, and bottom-hole pressures of 2,280-2,480 psi., flowing, and 2,940 psi., shut in. Recovery was 1,025 ft. of water cushion, cut with mud and condensate, and 120 ft. of salt water.

WASHINGTON

Socal Drilling Ahead On Rattlesnake Hills Test

Standard Oil Co. of California was drilling ahead below 2,374 ft. on 1 Rattlesnake Hills Unit in Benton County. This wildcat, with a projected total depth of 8,000 ft., is located about 15 miles north of the town of Prosser.

Yearbook Released

Initial mailing of Volume 27 of "Oil and Gas Field Development in the United States and Canada" has been made, Kelly Scott, president of the National Oil Scouts and Landman's Association, publisher of the book, has announced. The book was completed August 26 and approximately 1,200 volumes were shipped from Austin shortly thereafter.

This is the earliest that an edition of the NOSLA Yearbook has ever been sent out, Scott said. Volume 27, which reviews oil activity during 1956, is also the largest volume published since the association was established. It contains 1,264 pages. Although the book is primarily for members of the association, a nonprofit organization, nearly half the limited edition is sold to other members of the oil industry, libraries, etc. It is considered a standard reference work.

Successful Wildcats

PENNSYLVANIA

Indiana County, Armstrong Township: James Drilling Co. 1 August Stase, IP 4,106 M.c.f. of gas per day after fracture. Psi. 2,900 in 48 hours. Chert 7,325 ft. Gas 7,326 ft. TD 7,590 ft.

CALIFORNIA

Santa Barbara County: Sunray Mid-Continent Oil Co. 1 Sisquoc Ranch, NE SW 19-9n-31w, 300 BOPD, (no dope hole), TD 4,824 ft. (New field discovery 5 miles east of Olivera Canyon area).

Los Angeles County: Intex Oil Co. 2 Yule, NW NW 31-5n-16w, 139 BOPD, 13 per cent cut, 17.3°-gravity crude, perfs. 1,009-

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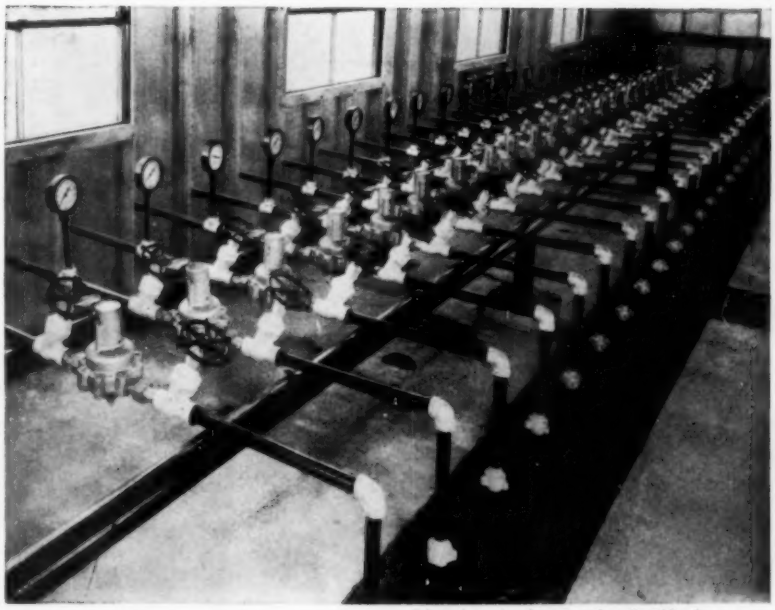

Edward steel valves guard and guide the flow in this big Texas water flood project.

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By JACK STIVERS,
Drilling and Production Supt., Miami Operating Co., Inc., Abilene, Texas

"Over a year ago," says Jack Stivers, "we installed forty-two of these Edward forged globe valves on the KMA Unit, Kempner Field, Wichita County, Texas, Flood. They've throttled since the day we started the flood—and we've had absolutely *no* maintenance costs so far. 2,063,905 barrels of water have been metered through these valves. Yet they *still* shut off tight—without forcing—to isolate meters. Bud Oweiss, our Edward representative, recommended this type of valve, and we are glad we followed his advice. In fact, we're using the same type on our newest flood, too, at Acme Unit, Clay County, Texas."

The Edward valve recommended for this service was Fig. 2698 forged steel, inside screw globe valve. This valve has a precision-built interior, with no pockets to collect sediment; EValized bonnet and packing nut to prevent thread galling . . . and centerless ground stem for long packing life—and packing is easily adjusted or replaced, if ever necessary. If you've been on the lookout for an efficient, dependable valve for water flood service—and want it at moderate cost—you'd be wise to contact your nearest Edward oilfield representative . . . or your favorite oilfield supply store.

Fig. 2698
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Globe Stop
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1,141 ft., TD 1,357 ft. (New field discovery in Charlie Canyon area of north Los Angeles County).

Kern County: Union Oil Co. 53-27 Union-Hancock-Houchin-Guimarra, 909 BOPD, 33.8° gravity, 0.4 per cent cut, 18/64-in. choke, perfs. 8,125-8,225 ft., TD 9,104 ft. (Extension test ½ mile northwest of Houchin area discovery well).

Richfield Oil Corp. 26-29 KCL D, NW SW 29-11n-20w, 540 M.c.f. daily, 11/64-in choke, perfs. 2,538-78 ft. TD 10,536 ft., plugged above 2,340 ft. (Completed as gas discovery between Telegraph Canyon area and regular Wheeler Ridge production).

Kern County: Trico Oil & Gas Co. 51-25 Veon, NW NE 25-30s-21e, 114 BOPD, 36°-gravity crude, 0.1 per cent cut, 17/64-in. choke, perfs. 5,548-5,633 ft., TD. 6,392 ft. (New pool discovery on southwest edge of Belgian Anticline field.)

ALBERTA

Husky Baysel 1-13-54-17 Pinedale, LSD 1, 13-54-17w4. TD 2,888 ft. Indicated gas well.

BRITISH COLUMBIA

Pacific 15 Buick Creek, unreserved British Columbia TD 4,145 ft. Nikinassin oil well.

SASKATCHEWAN

Riddle Tidewater 16-32 Rocanville Crown, LSD 16, 32-15-31w1. TD 5,408 ft. Bakken oil well.

ILLINOIS

White County: H. Sackett-Ashland 1 Ward, NW SW SE 19-5s-9e. IPP 28 BOPD, 43 BWPD, Aux Vases 3,142-80 ft. TD 3,333 ft. Extension to Trumbull pool.

Franklin County: NAPCO 1 Lindsay-Moschino "H," NE SE 14-6s-1e. IPP 132 BOPD, 169 BWPD, St. Louis 3,002-22 ft. Devonian 4,459-80 ft. TD 4,538 ft. New pay (St. Louis) in Christopher Consolidated pool.

Marion County: Rhea Fletcher 1 Tom Sawyer, NE SE SW 3-1n-3e. IPP 51 BOPD, McClosky 2,664-72 ft. TD 2,779 ft. Extension to North Exchange pool.

Clay County: Robinson Oil Co. 1 L. Benskin "A," NW SE SE 6-3n-7e. IPP 45 BOPD, 10 BW, O'Hara 2,988-93 ft. TD 3,135 ft. Extension to Sailor Springs Consolidated pool. The Texas Co. 1 L. Knoll, SE NE SE 30-4n-8e. IPP 149 BOPD, McClosky 3,008-13 ft. TD 3,044 ft. Extension to Sailor Springs Central pool.

INDIANA

Gibson County: C. E. O'Neal-Wausau Petroleum Co. 1 E. L. Thompson, NW NE SW 33-2s-11w. IPP 42 BOPD, Benoist 2,223-29 ft. TD 2,435 ft. Extension to King pool.

WESTERN KENTUCKY

Christian County: Nick Dodd et al 1 Dr. Erkiletian, 7-G-26. IPP 50 BOPD, O'Hara 902-07 ft. TD 907 ft. New pay and extension.

Hopkins County: Stouder and Ashland 1 C. P. Ferguson, 15-I-25. IPF 75 BOPD, 500 M.c.f. of gas per day, Tar Springs 1,498-1,531 ft. TD 2,298 ft. New pay in West Oak Hill field.

Muhlenberg County: R. Boggess et al 1 Boggess, 12-I-28. IP 500 M.c.f. of gas per day, Bethel 1,789-95 ft. TD 1,795 ft. Luzerne gas discovery.

SOUTH LOUISIANA

Allen Parish: Beck Oil Co. 1 Industrial, 36-6s-7w. IP 198 BOPD, ⅛-in., 42.1°, GOR 950 cu. ft. per bbl., TP 3,100 psi., perforations 10,124-56 ft. TD 10,457 ft. (New oil reservoir in Reeves area.)

Terrebonne Parish: Austral Oil Exploration Co., Inc., 1 DuPlantis, 49-18s-18e. IP 95 BOPD and 4,020 M.c.f. daily, 5/32-in., 42.8°, TP 8,300 psi., perforations 12,545-56 ft. TD 12,591 ft. (New field—2½ miles south of Bourg field.)

Vermilion Parish: Trice Production Co. and Christie, Mitchell & Mitchell 1 Wise, 62-13s-3e (3 miles southwest of Erath field). IP 175 BOPD, 3/32-in., 48°, GOR 115 cu. ft. per bbl.., TP 1,620 psi., perforations 10,617-23 ft. TD 10,597 ft. (New field.)

MISSISSIPPI

Adams County: Eagle Drilling & Development Co. 2-W Armstrong, 16-5n-2w. IP

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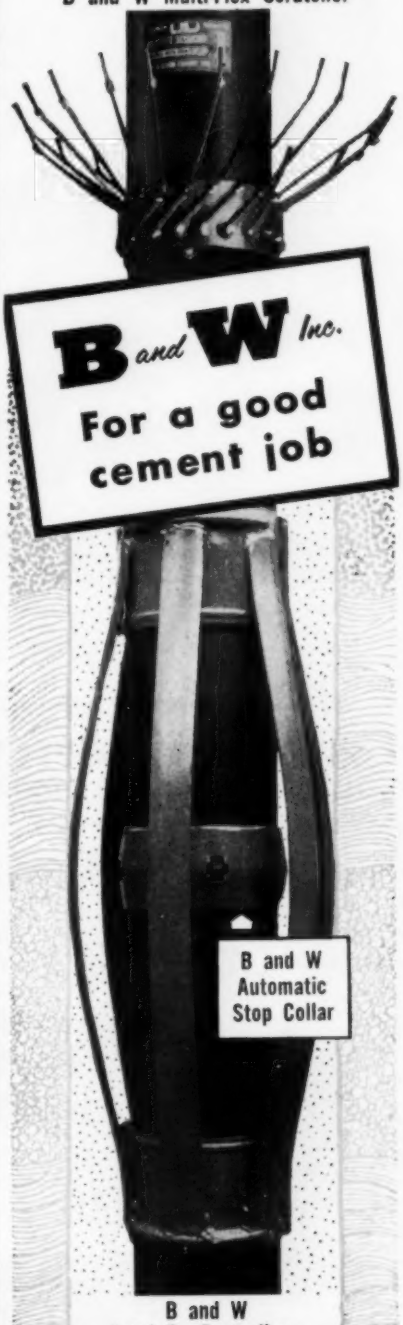

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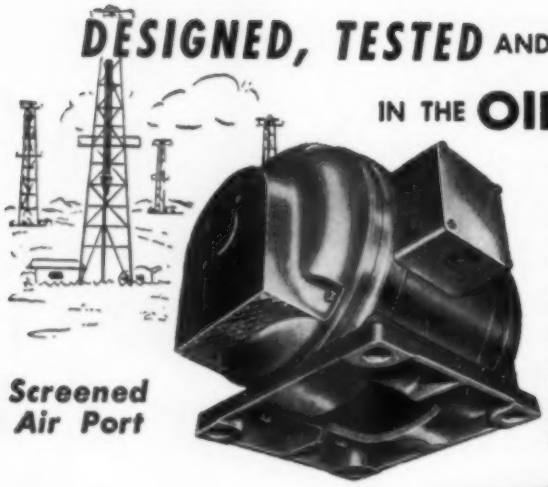

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CHECK THESE OUTSTANDING ADVANTAGES.

Heavy Cast base for alignment, stability, heavy duty, double-shielded, prelubricated bearings, reduces lubrication worries, high grade silicon steel in the magnetic circuit reduces iron losses . . . Wide variety of windings provides triple ratings, dual voltages . . . high torque licks heavy starting problems. High slip is available to take care of reciprocating load requirements encountered in pumping.

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BETHLEHEM SUPPLY CO. TULSA, OKLAHOMA

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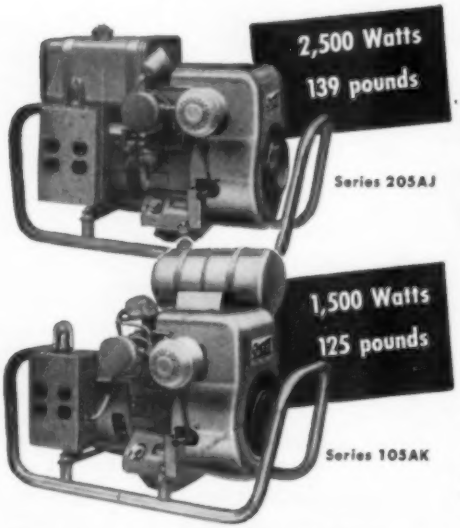

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144 BOPD, 5/32-in., 42°, TP 180 psi., perforations 5,616-20 ft. (Wilcox). TD 5,,760 ft. Elev. 101 ft., Wilcox 4,619 ft. (Extends Mandamus field.)

NORTHWEST NEW MEXICO

Rio Arriba County: Skelly Oil Co. 16 Jicarilla "C," SE NW NW 34-25n-5w. IPF 192 BOPD, Gallup discovery, new pay. TD 7,316 ft. Morrison.

Sandoval County: Northwest Production Co. 1-23 Sandoval, 22-7. C NE SE 23-22n-7w. IPP 35 BOPD, Gallup discovery, new field. TD 5,975 ft. Morrison.

COLORADO

Logan County: Lowell J. Williamson 1 Hall, C NW SW 15-6n-53w. IPP 110 BOPD, "D" sand discovery, new field. TD 4,649 ft. "J" sand.

Weld County: Lowell J. Williamson 1 Government-G, C NE NE 12-11n-57w. IPP 43 BOPD, "J" sand discovery, new field. TD 6,710 ft. "J" sand.

NEBRASKA

Banner County: Wytex Oil Co. et al 1 Shively-Penick, C NE SW 21-18n-56w. IPF 173 BOPD, "J" sand discovery, new field. TD 6,719 ft. Skull Creek.

Kimball County: Mountain Valley Oil Co. 1 Stevens, C NE NE 13-13n-56w. IPP 220 BOPD, "D" sand discovery, new field. TP 6,555 ft. Skull Creek.

Morrill County: Lowell J. Williamson 1 Waitman, C SE NE 32-19n-52w. IPP 155 BOPD, "J" sand discovery, new field. TD 4,788 ft. "J" sand.

WYOMING

Big Horn County: Empire State Oil Co. 1 Government, NW NW 15-55n-96w. IPP 55 BOPD, Phosphoria discovery, new field. TD 8,046 ft. Madison.

Big Horn County: Sohio Petroleum Co. 3 Alkali Anticline Unit, NE NW NE 32-55n-95w. IPP 170 BOPD, Phosphoria-Tensleep discovery, new field. TD 6,754 ft. Madison.

Laramie County: Wyoming Western Oil Co. 1 Evelyn Floy, C SW SW 4-15n-61w. IPP 170 BOPD, "J" sand discovery, new field. TD 7,712 ft. "J" sand.

MONTANA

Hill County: The Texas Co. 1 C. Bradbury, C NE NE 10-33n-9e. IP 2,980 M.c.f. of gas per day, Sawtooth discovery, new field. TD 3,585 ft. Madison.

TEXAS GULF COAST

Colorado County: Great Lakes Carbon Corp. 11-A Brownson, E. S. Wooley Sur., A-584. Shut-in gas well, no gage, TD 4,133 ft. (New pay and extension in Garwood area.

Great Lakes Carbon Corp. 2 McOldham, George T. Allen Sur. 16. Shut-in gas well, no gage, shut-in tubing pressure 1,550 psi., TD 3,822 ft. (New pay in Garwood area.)

DeWitt County: MPS Production Co. 1 Dreier, James Turner Sur., A-460. Shut-in gas well, no gage, tubing pressure 1,300 psi., perforations 3,159½-61½ ft. (Frio). TD 8,530 ft. (New pay in East Meyersville field.)

Harkins & Co. 1 Matthews, John R. Foster Sur., A-189 (15 miles northeast of Cuero). IP 11,500 M.c.f.f daily, absolute open-flow potential, GIR 100 M.c.f. per bbl., 60°, shut-in tubing pressure 1,963 psi., perforations 5,180-84 ft. (Yegua). TD 8,215 ft. (New field.)

Midstates Oil Corp. 1-A Helfrich, Miguel Ortiz Sur., A-42 (4 miles southwest of Mission Valley). IP 600 M.c.f. daily, 5/32-in., TP 1,090 psi., perforations 2,791-93 ft. (Frio). TD 8,345 ft. (New pay in North Mission Valley field.)

E. R. P. engineer inspects control panel for cathodic system protecting clarifiers at Louisville Water Co., Louisville, Ky.

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Electro Rust-Proofing Cathodic Protection is used by the Louisville Water Company to prevent corrosion of metal underwater equipment in the raw water clarifiers.

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No. 856 "Vulcodisc" Lift Check Valve

Vulcanized asbestos disc. For 200 lbs. working steam pressure at 500° F. or 400 lbs. working non-shock gas and liquid pressure at 150° F. Installed in horizontal position. Screw cap and screw ends.

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Goliad County: Amerada Petroleum Corp. 1 Lanier Hanley, L. Webster Sur., A-301 (¾ mile northwest of Fannin). IP 89,000 M.c.f. daily, absolute open-flow potential, dry gas, shut-in tubing pressure 1,526 psi., perforations 3,630-40 ft. (Frio). TD 4,252 ft. (New pay and extension of North Alkek field.)

Jefferson County: Meredith & Co., et al 1 Edwards et al, William McFaddin Sur., A-418, Rge. M, Block 12 (4 miles northwest of Port Arthur). IP 16,478 M.c.f. daily, absolute open-flow potential, 838.73 BC per day, 48.8°, open hole 10,529-34 ft. TD 10,534 ft. (New field.)

Live Oak County: Standard Oil Co. of Texas 1 Isaacks, Louis Ayers Sur., A-2 (2 miles northeast of Calliham). IP 1,350 M.c.f. daily, absolute open-flow potential, shut-in tubing pressure 2,965 psi., perforations 12,456-12,736 ft. (Edwards). TD 13,800 ft. (New field and first Edwards production in county.)

Victoria County: Harkins & Co., George A. Musselman, and Argo Oil Co. 1 George Albrecht, William J. Eaton Sur., A-164 (3½ miles northwest of Mission Valley). IP 5,600 M.c.f. daily, absolute open-flow potential, shut-in tubing pressure 1,242 psi., perforations 3,002-05 ft. (Frio). TD 9,015 ft. (New pay and extension in East Meyersville area.)

SOUTHWEST TEXAS

Brooks County: Associated Oil & Gas Co. et al 2-F J. L. Cage, Section 656, Ireno Lopez Sur., A-381. IP 5,100 M.c.f. daily, absolute open-flow potential, GLR 136 BC per M.M.c.f., 58.8°, shut-in tubing pressure 3,275 psi., perfs. 8,262-74 ft. (Vicksburg). TD 8,550 ft. (New reservoir 2½ miles south of Cage Ranch field.)

Dimmit County: Pronto Drilling Co. 1 Paul Little, Narciso Aguirre Grant, A-3, Sec. 177-A, Cross "S" Ranch Subd. IP 165 BOPD, 3/16-in., 35°, GOR 680 cu. ft. per bbl., TP 480 psi., perforations 4,421-39 ft. (San Migel FB-3 sand). TD 4,447 ft. (New oil pay in North Elaine field.)

Duval County: C. C. Winn 1 Richard J. Rogers, Sec. 275, J. Poitevent Sur., A-424 (9 miles northwest of San Diego). IP 41.02 BOPD, ⅛-in., 27.1°, GOR 762 cu. ft. per bbl., TP 650 psi., perforations 3,542-43 ft. (Hockley). TD 4,326 ft. (New pay in Bridwell field.)

Hidalgo County: Humble Oil & Refining Co. 2 W. K. Shepperd Estate, La Coma Tract 95, San Salvador del Tule Grant (6½ miles southeast of Linn). IP 7,000 M.c.f. daily, absolute open-flow potential, GLR 72.41 M.c.f. per bbl., 51.7°, perforations 9,189-9,203 ft. TD 9,547 ft. (New pay in Sal Del Rey area.)

Jim Hogg County: Gorman-Gierhart-Howe 1-C East, Sec. 641, A. V. Prado Sur. (14 miles southwest of Hebbronville). IP 4,000 M.c.f. daily, absolute open-flow potential, dry gas, shut-in tubing pressure 1,255 psi., perforations 3,463-68 ft. (upper Government Wells sand). TD 4,250 ft. (New pay and extension in Prado field.)

Jim Wells County: Dellinger & Dellinger 10 fee, Sec. 18, Richard King Farm Lots (6 miles northwest of Agua Dulce). IP 81.20 BOPD, 5/-32-in., 41.2°, GOR 1,620 cu. ft. per bbl., TP 740 psi., perforations 5,282-86 ft. (Frio-U-2 sand). TD 5,337 ft. (First oil well in U-2 sand in Captain Lucey field.)

Starr County: Wood Brothers & Langham 5 G. P. Wardner, Trustee, Porcion 84 (4½ miles northeast of Rio Grande City). IPP 26 BOPD, 22°, perforations 1,542-47 ft. (Frio). TD 1,650 ft. (New pay in El Tanque field.)

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It's surprising how little oil's customers know about the biggest selling petroleum product—gasoline! They never see it or touch it—yet they *use* it every day. All they know is the price they pay . . . and only a few know how big a bargain they really get with today's gasoline.

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Dr. A. I. Levorsen . . .

Famous geologist to speak at A.A.P.G. regional meeting

October 31 to November 1, Tulsa

DR. A. I. LEVORSEN, prominent consulting geologist, will address the Mid-Continent regional meeting of the American Association of Petroleum Geologists, October 31-November 1 in Tulsa. Topic of Dr. Levorsen's speech will be, "The Mid-Continent—Land of Geological Opportunity."

Dr. Levorsen believes that the Mid-Continent region offers unsurpassed opportunities for the young petroleum geologist to learn the geology of petroleum, the technology of exploration and production, and the business of oil and gas. Here we see a concentration of large numbers of oil and gas pools of many geologic ages, all accumulated under geologic environment of great diversity.

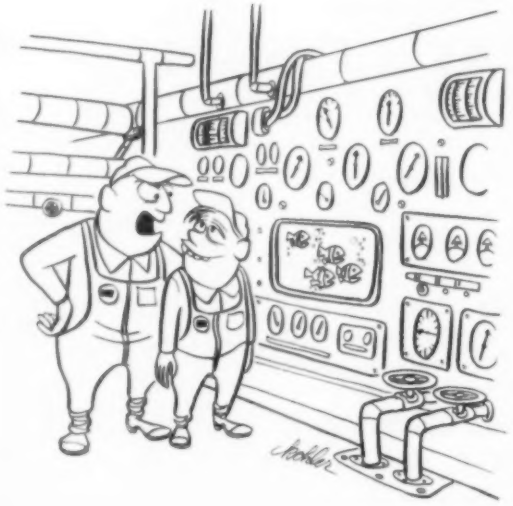
Nor is the end in sight, Dr. Levorsen contends, but it is still a long way ahead.

The vast quantities of well records, well samples, surface and subsurface maps, and engineering and production data, furnish the basis for the four dimensional thinking—length, breadth, thickness, and time—necessary to reconstruct the geologic history and thereby better predict what to expect under the surface. We see here the most advanced technology practiced daily—and talked about weekly, biweekly, and monthly at innumerable technical meetings of all kinds. And for those who have business acumen and administrative ability, the countless petroleum organizations of all kinds offer abundant opportunity for advancement up the organizational ladders.

Here we may observe continuously the advantages of our free, American, competitive system as a way of creating natural resources, Levorsen says. The Mid-Continent is a shining example of this way of finding the oil and gas that lie buried as compared with the monopolistic and nationalistic methods of many foreign countries.

The Mid-Continent is truly a land of opportunity for learning for those who plan to devote their lives to the finding and production of oil and gas anywhere in the world.

Dr. Levorsen speaks with considerable authority on the Mid-Continent, for he has had many years of oil-finding experience in the area. He is a graduate of the University of Minnesota and a member of several professional societies. He is a past president of both the American Association of Petroleum Geologists and the Geological Society of America. He is now a consulting geologist, specializing in foreign exploration.



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THE OIL AND GAS JOURNAL

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A planned mud program results in better, safer drilling, and proves itself in more hole drilled for less money. Plan ahead with Magcobar on your next well. Plan to make full use of Magcobar's complete drilling mud service. You will get the best drilling mud materials and chemicals. You will get the mud industry's best trained and qualified engineers. Use the *full* facilities of Magcobar, the industry's leading supplier of drilling mud.

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BP CELEBRATES A BIRTHDAY

1957 BRINGS the 40th birthday of The British Petroleum Company's Research Station at Sunbury.

Started in 1917, in the basement of an old country house, the station now covers 39 acres and employs some hundreds of scientists, skilled workmen and technicians.

Many important developments have sprung from this great pool of first-class brains and brilliant equipment, not the least being the catalytic process of 'autofining', which is now in full scale operation at several of the Group's Refineries.

It is from Sunbury, too, that teams of Research Specialists go to make vital 'on the spot' tests in conditions of intense heat and cold in such places as North Africa and Northern Sweden. It was also at Sunbury that fuels and lubricants were tested for the Commonwealth Antarctic Expedition.

The Company's famous green and yellow shield is generally accepted as the criterion of all that is best in aviation and motor spirits, oils, greases and products for a dozen different uses and industries. At Sunbury, unremitting research and checking ensures that the quality of these products shall never fall short of supreme.

The BP Shield is the symbol of the world-wide organisation of

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RICHARD E. LAUTERBACH
. . . he's got four jobs in one

G.P. needs a V.P., so . . .

. . . Lauterbach Moves Up

RICHARD E. LAUTERBACH is the new quadruple-threat man of General Petroleum Corp.

G. P. is tapping Lauterbach for vice president and director of manufacturing, effective October 1.

He will keep his old job, assume the duties of two others, and do the work as a vice president as well.

Ever since he won a chemical engineering degree and a Phi Beta Kappa key from U.C.L.A. 21 years ago, Dick Lauterbach has been doing things the G. P. way—so much so, in fact, there's a suspicion he got the G. P. way started in the first place.

So—when Socony Mobil Oil Co., Inc., the parent company, promoted Thomas P. Simpson to head Socony's manufacturing operations in New York, General Petroleum picked Lauterbach for the vacated vice presidency.

While holding only one title, he will continue his duties as manager of manufacturing, a job he has held 5 years. He also will do the work of the manager of refineries and assistant manager of manufacturing—two positions currently unfilled. G. P. will abolish all these excess titles and consolidate their functions into Lauterbach's office.

To the top . . . Since going to work for General Petroleum as a laboratory assistant in 1936, Lauterbach has done everything from cleaning test tubes to scheduling runs for a 165,000-bbl. refinery operation.

After 3 years he was promoted to chemical engineer in the labs and in 1945 was moved out to the 128,000-bbl. refinery at Torrance, Calif., as a refinery engineer. By 1950 he became assistant manager of the refinery.

In 1952, G. P. appointed him manager of the Ferndale, Wash., refinery, then under construction. But before he could get out of town he was named manager of manufacturing and stayed on in Los Angeles.

A California native, reared in San Diego, Lauterbach was delighted at staying home.

Currently he is pursuing his life-long devotion to the California way of life by spending idle moments around a recently completed swimming pool at his home in Rolling Hills.

Lauterbach is active in the Phi Beta Kappa society, the American Chemical Society, the American Petroleum Institute, and the Los Angeles Chamber of Commerce. Currently he is president of the Engineering Club of Los Angeles.

Personals

Keith Summerville has joined Felmont Oil Corp. in Midland, Tex., as research geologist.

P. J. McClellan has been transferred from Orla, Tex., where he was foreman for Ohio Oil Co., to Seminole, Tex., as production foreman.

James D. Craig has joined Empire Drilling Co. to head up that firm's new division office at Midland, Tex., as division manager. **R. L. Maples** has been named superintendent of the new Empire division.

F. C. Goodson has left Procon, Inc., where he was superintendent in Des Plaines, Ill., to join D-X Sunray Oil Co. as maintenance superintendent of the company's West Tulsa refinery.

Dr. August Goldstein, Jr., has joined Bell Oil & Gas Co., Tulsa, as chief geologist. A graduate of Louisiana State University and the University of Colorado, Goldstein was formerly with Pan American Petroleum Corp.

John T. O'Neal, Jr., vice president and general manager of O'Neal Drilling Co., and **L. D. Thomason,** manager of its Fort Worth office, have been transferred to Midland, Tex., in a move which will change the company's headquarters from Fort Worth to Midland. **John T. O'Neal, Sr.,** president of the company, will remain in Fort Worth.

Harold D. Hoopman has been named operations manager of Ohio Oil Co. of Guatemala. Hoopman joined Ohio Oil in 1946 as an engineer in Cody, Wyo. He became rotary-drilling foreman in 1951, and was named superintendent of uranium exploration in the company's Casper, Wyo., production division in 1955.

Thomas N. Banks has been appointed Santa Barbara, Calif., division manager for Southern Counties Gas Co. Banks, formerly superintendent of the company's San Gabriel Valley division, succeeds **George W. Smith,** who has retired. **Monte S. Christie,** superintendent of the Santa Barbara division, will replace Banks in the San Gabriel Valley division. **Fred B. Bennett,** distribution supervisor, San Gabriel Valley division, will succeeded Christie as superintendent in Santa Barbara.

Personals

D. R. FORD

Don R. Ford has been promoted by Magnolia Pipe Line Co. from vice president and assistant manager to a new post as manager of the company. **J. E. McGeath,** formerly general superintendent, has been named assistant manager to replace Ford. **M. E. Powell,** formerly assistant general superintendent, moves up to replace McGeath as general superintendent. Ford, who takes over the top operating post of one of

M. E. POWELL

J. E. McGEATH

the country's largest pipeline systems, has been with Magnolia since 1927, starting as a laborer at its Wewoka, Okla., station. He was named assistant manager of the company in 1949, a director in 1951, and vice president in 1952. McGeath joined the firm in 1923, Powell in 1931.

Logan W. Dailey, general foreman of the light-oils division in the Casper, Wyo., refinery of Standard Oil Co. (Ind.), has retired after 45 years in the oil business.

Ted R. Moore has been promoted by Cities Service Oil Co. from district production engineer in Lafayette, La., to methods study engineer in the production division. Moore has been with Cities Service since 1952.

Ralph W. Hill, formerly senior mechanical engineer with Pan American Petroleum Corp., has been named president of Major Engineering Co., Tulsa. Major Engineering is a new firm which designs, manufacturers, and sells automatic-custody-transfer units. Directors of the company include **C. H. Keplinger,** partner in Keplinger & Wanenmacher; **Henry A. Sherman,** vice president of Schermerhorn Oil Corp.; **Paul R. Schultz,** president, Blackwell Oil & Gas Co.; **N. D. Helland,** Oklahoma Blue Cross and Blue Shield; and Hill. Keplinger has been elected vice president of Major.

Clair H. Lewis, senior engineer with Columbia Gas System in Columbus, Ohio, has retired after 40 years with the company and its affiliates.

D. M. Simmons, assistant superintendent of drilling and production for Union Producing Co., has retired. Simmons joined Palmer Corp., predecessor of the Union Gas system, in 1921.

Howard D. Tarr has joined Roden Drilling Co., Inc., in Big Piney, Wyo., as tool pusher. He was formerly tool pusher with Helmerich & Payne, Inc., in Lindsay, Okla.

J. W. Roche has been appointed Calgary area production manager for Shell Oil Co. Roche has been Denver area production superintendent. In Calgary he succeeds **W. R. Lund,** who has been transferred to New Orleans as production manager there.

Clyde C. Copper has been named superintendent of measurement for Northern Natural Gas Co. He succeeds **J. L. Griffin,** who has retired after 27 years with the company. Copper has been assistant superintendent of measurement since 1948.

L. C. Davidson, general traffic manager for Cities Service Oil Co., has been transferred to Bartlesville, Okla., from Chicago. The move will consolidate Chicago and Bartlesville sections of the traffic department, supply and distribution division.

W. L. Myers and **J. P. Garrison, Jr.,** engineers with Lago Oil & Transport Co., Ltd., Standard Oil Co. (N. J.) affiliate in Aruba, Netherlands Antilles, have been given European assignments with Esso Research & Engineering Co. Garrison will be field engineer in Cologne, Germany; Myers, field engineer in Milford Haven, England.

Clinton C. Steward has been appointed assistant manager in charge of engineering and process in the petrochemical division of Holmes & Narver, Inc., Los Angeles engineers and constructors. Steward was with Ralph M. Parsons Co., Bechtel Corp., and International Petroleum Corp., before joining Holmes & Narver.

D. Carlton Jones, superintendent of natural-gas utilization for Hudson's Bay Oil & Gas Co., Ltd., has been appointed assistant manager of production. Jones has been with the company since 1954. He was formerly with Canadian Western Natural Gas Co. and Denton-Spencer Co., Ltd. He is a graduate of McGill University.

W. L. TAYLOR

Warren L. Taylor has been named chief geologist, a newly created position, by El Paso Natural Gas Co. Taylor will move to the El Paso headquarters from Salt Lake City where he served until recently as division superintendent. **A. L. Miller, Jr.,** formerly geologist for the company at Salt Lake City, has been named superintendent of the firm's newly created division office at Amarillo, which includes the Texas and Oklahoma panhandles. **J. G. Wilkins** has been named superintendent at Salt Lake City replacing Taylor. **Roy L. Prichard** has been named superintendent of the Farmington, N. M., division replacing **William L. Speer,** and **Larry C. Zink** takes over as division superintendent at Midland, Tex., replacing **Roy Allen.** Both Zink and Allen recently were transferred to El Paso Natural's subsidiary, El Paso Natural Gas Products Co., to help set up that company's newly organized exploration and production department. Allen was named chief geologist, and Speer took over as division geologist at Farmington.

David L. Dobie has been promoted by Sinclair Oil & Gas Co. from staff landman in the Tulsa division to division exploration manager. He succeeds **R. L. Elston,** recently named assistant manager of the Midland, Tex., division. Dobie has been with Sinclair since 1952.

C. E. Erdmann, geologist in charge of United States Geological Survey's northwest regional office in Great Falls, Mont., has been promoted to research geologist. **A. F. Bateman,** staff geologist at Great Falls since 1946, has been named acting regional geologist succeeding Erdmann, who has been with USGS since 1924.

Joseph D. Harnett, vice president for transportation of Standard Oil Co. (Ohio), has been appointed assistant to the president. He continues as a vice president. Harnett will transfer to Cleveland from St. Louis. **Henry W. Pattison,** general superintendent of transportation operations, moves up to manager of transportation department. Harnett has been with Sohio since 1941. He became general superintendent of pipeline operations in 1947 and manager of transportation department in 1954. Pattison joined the company in 1946. He has been general superintendent of transportation operations for the past year.

DuBois Eastman, director of The Texas Co.'s Montebello, Calif., laboratories, and **Robert P. Eischens,** of the physical research department in Texaco's Beacon, N. Y., research center, have received awards for outstanding research from American Chemical Society. A.C.S. broke a precedent by honoring two scientists from a single company last week. Eastman received the A.C.S. Award in Industrial and

R. P. EISCHENS

D. EASTMAN

Engineering Chemistry for his work in developing the Texaco synthesis gas generation process. This process is used to make hydrogen from natural gas and heavy fuel oil in 25 chemical plants now operating or building in North and South America, Europe, and Asia. Eischens received the Precision Scientific Co. Award in Petroleum Chemistry. It recognizes his contributions to catalysis research.

Charles W. Weeks has been named Sun Oil Co.'s district geologist for south, central and northeastern Alberta. Weeks joined Sun in 1952.

Bev Duane Blackwood has been transferred by Humble Oil & Refining Co. from Winters, Tex., to Houston as petroleum engineer.

Stanley G. Cohen, Midstates Oil Corp. trainee engineer, has been transferred to Dickinson, Tex., from Seminole, Okla.

Samuel J. Mathis has been named head of Creole Petroleum Corp.'s general engineering department in Caracas, Venezuela. Also in Creole's Venezuelian operations, **Frederico Baptista** has been named assistant production manager with headquarters in Caracas. He has been on training for a year in the New York office of Standard Oil Co. (N. J.), the parent company. **Robert Graham,** formerly with Carter Oil Co., has joined Creole's petroleum engineering group in the Quiriquire district. **George Seely,** coordinator at La Salina, will retire next month, and **Karl F. (Dit) Dallmus** has retired as head of special studies in the Caracas geological department. Dallmus will remain in Venezuela as a consultant with **Wayne Thoms,** another former Creole geologist.

J. D. Jones has arrived in Venezuela from Alaska to be the new drilling superintendent for Phillips Petroleum Co.'s Lake Maracaibo operations.

John M. Greene, field engineer with Shell Oil Co., has been appointed production geologist and transferred to Oklahoma City from Woodward, Okla.

Royal I. Clark has been transferred by Helmerich & Payne, Inc., from Sayre, Okla., to Lindsay, Okla., as tool pusher.

Dr. Herman S. Bloch, deputy director of refining research for Universal Oil Products Co., has received the 1957 Honor Scroll of American Institute of Chemists, Chicago chapter.

Charles E. Price has been transferred by Murphy Corp. from Shreveport, La., to Denver, where he will be assistant division production superintendent.

Robert O. Garrett, vice president and general manager of Texas Gas Exploration Corp., has been elected a director. Garrett was exploration manager of Arkansas Louisiana Gas Co. before joining Texas Gas 2 years ago.

J. E. Finley has been appointed assistant southwestern regional manager of exploration for Continental Oil Co. He will headquarter in Fort Worth. Finley has been assistant to the manager of Conoco's headquarters geophysical section in Houston. He joined Continental in 1948 and was division geophysicist and division manager of exploration at Midland, Tex., before transferring to Houston early this year.

Standard-Vacuum Oil Co. has made a major shift of top personnel in four operating subsidiaries, sparked by the forthcoming retirement of **Richards J. Bard** as general manager in Indonesia. The company has named **Bruno D. Winkler,** assistant general manager, as Bard's successor. Winkler, in turn, was succeeded by **Allen Myra,** formerly managing director of the company's Bombay, India, refinery. **J. B. Hanna,** formerly managing director of the Durban, South Africa, plant, succeeds Myra at Bombay. Hanna has recently been on special assignment at Stanvac's home office, White Plains, N. Y. **R. J. Anderson,** refinery manager at Durban, was appointed refinery manager of the Altoona, Australia, plant. **J. C. Howard,** refinery manager at Altoona, was moved to the same post at Bombay. **W. D. Sumner,** on loan to Durban, is returning to the Everett, Mass., refinery of Esso Standard Oil Co.

Personals

David R. Pugh has been transferred by Colorado Oil & Gas Corp. from Magnolia, Ark., where he was district engineer, to Denver, where he will be production engineer.

Ernest J. Dickinson has been promoted by Magnolia Petroleum Co. from assistant production foreman to production foreman in the company's Lake Charles, La., producing district.

DEATHS

D. Glenn Morgan, 67, Tulsa, retired director of research and development for D-X Sunray Oil Co., died September 10 at a Chicago airport after a heart attack. He was en route to Atlantic City, N. J., to attend a National Petroleum Association convention there. Morgan had been with D-X Sunray and its predecessor companies since 1917. He was general superintendent and general manager of the company's West Tulsa refinery before becoming research director in 1945. Since his retirement a few months ago, he had served as consulting technologist with Western Petroleum Refiners Association.

William Dewey Loucks, 77, former chairman of the old Barnsdall Oil Co., died Wednesday at his home in New York. A corporation lawyer, Loucks was prominent in the field of hotel reorganization. He retired as chairman and general counsel of Barnsdall in 1950.

John Virgil Brazier, 60, partner in Dealers Refining Co., died September 5 in Tulsa. Brazier was a former vice president of Petroleum Marketing Co., Barnsdall Refining Co., and Bareco Oil Co.

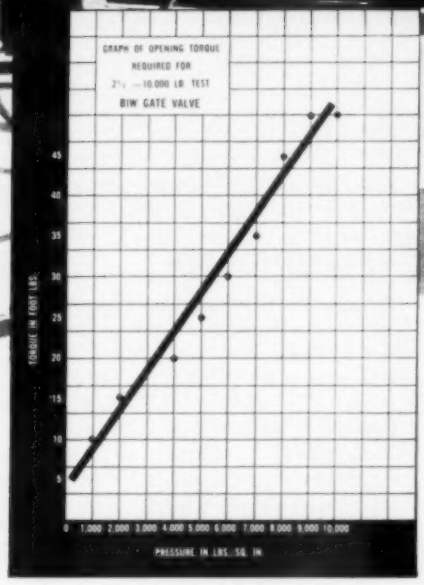
Arthur F. Sonberg, retired drilling manager for United Gas Co., died September 4 in San Antonio. He was 66.

John L. Fye, 44, partner in Sanders & Fye Drilling Co., died September 3 in Olney, Ill.

Roger L. Dailey, 57, division manager of National Supply Co.'s eastern division since 1954, died September 4 in Toledo. Dailey joined National in 1922.

Albert E. McKenzie, 65, San Antonio, Tex., drilling contractor, died recently in San Antonio.

No Grunt, No Cheater, No Strain



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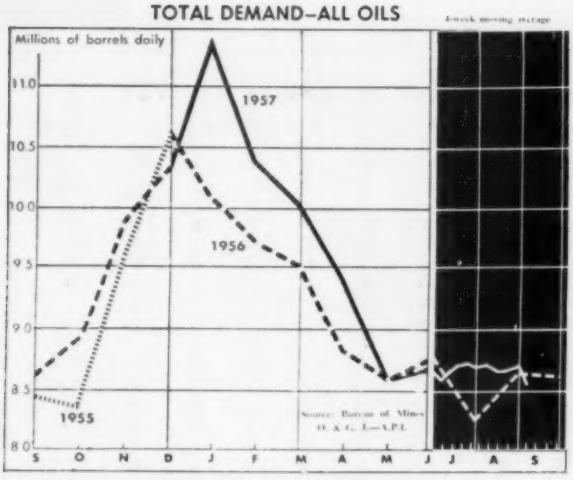
Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,819,960	UP	15,210	DOWN	215,560
Crude stocks	284,223,000	DOWN	3,455,000	UP	5,503,000
Completions	1,126	UP	30	UP	63
Refinery runs	8,270,000	DOWN	57,000	UP	83,000
Gasoline stocks	173,552,000	UP	1,869,000	DOWN	2,403,000
Kerosine stocks	34,827,000	UP	713,000	UP	2,129,000
Distillate stocks	159,886,000	UP	5,010,000	UP	17,155,000
Residual stocks	54,019,000	UP	1,547,000	UP	6,821,000
Four-product stocks	422,284,000	UP	9,139,000	UP	23,702,000
Total imports	1,795,200	UP	317,700	UP	490,500

TOTAL DEMAND—ALL OILS



Gasoline Prices Are Firming, But the Peak Driving Season Is About Over

SHIFTS in product prices in recent years have tended to limit refiners' revenue. In many cases, price decreases have come near the start of the peak season for the product. Later increases came after demand dropped off.

Here is an example. Group 3 regular gasoline was selling for 11.00 cents a gallon at the start of 1956. This was 86 octane gasoline. By the middle of May the quality was raised to 88 octane. The price was boosted to 11.75 cents but started dropping back within a few weeks. By the middle of June the price was off to 11.50 cents and to 11.25 cents by the middle of August. By the end of the year, regular gasoline was moving at 10.75 cents.

Market adjustments in January brought the price back up to 12.00 cents a gallon, following the increase in crude prices. The price held only until about the middle of March when a decrease of 0.25 cent cut quotations to 11.75 cents.

The quality of regular gasoline was raised one octane number in May and was available at most pipeline terminals by the end of the month. Regular gasoline, now 89 octane, moved back up to 12 cents a gallon, but the price held only about 2 weeks. A series of reductions knocked the price down to 11.25 cents a gallon by the first of July. Thus, at the start of the peak gasoline season regular was selling for the same price quoted for delivery in March 1956. In the meantime, crude advanced 25 cents a barrel and the quality moved up three octane numbers.

Group 3 gasoline prices have strengthened some in the past 3 weeks. Prices moved up 0.25 cent a gallon in the third week of August, and there have been some indications of additional strength since that time. One supplier sent out notices of another 0.25-cent increase in the first week of September but later withdrew the quotation.

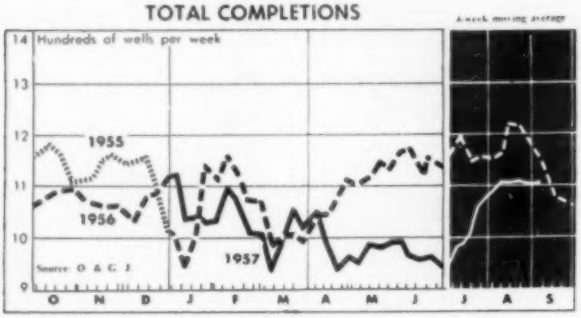
About the only consolation from these contraseasonal price trends is the fact that the spread between summer and winter demand for gasoline is shrinking. The following table shows gasoline demand by quarters, expressed as a per cent of daily average demand for the year. Most of the shift has been in the first and third quarters.

DOMESTIC DEMAND FOR MOTOR FUEL

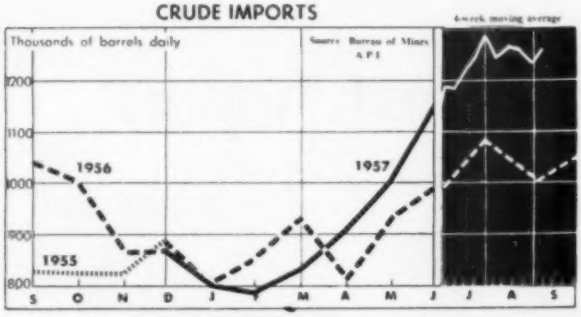
(Daily average by quarters as per cent of average for year)

	First quarter	Second quarter	Third quarter	Fourth quarter
1935	81.1	105.0	111.8	101.6
1936	79.6	104.7	113.2	102.2
1937	82.9	106.0	113.2	97.5
1938	84.2	104.8	109.4	101.0
1939	84.6	104.0	110.1	100.7
1940	84.3	106.5	109.0	100.8
1941	84.1	105.1	111.2	99.0
1942-45	(War years)			
1946	86.1	104.8	106.9	102.0
1947	85.6	103.6	108.3	102.3
1948	85.9	105.0	108.7	100.4
1949	86.3	105.5	107.6	100.4
1950	85.3	104.7	108.9	100.9
1951	89.3	104.4	106.8	99.3
1952	89.2	104.1	106.1	100.4
1953	90.6	105.4	105.8	98.1
1954	90.9	104.2	104.8	100.0
1955	89.2	105.4	105.3	100.1
1956	91.0	106.4	104.0	98.5

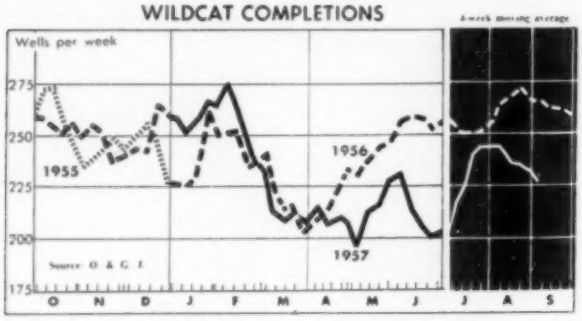
TOTAL COMPLETIONS



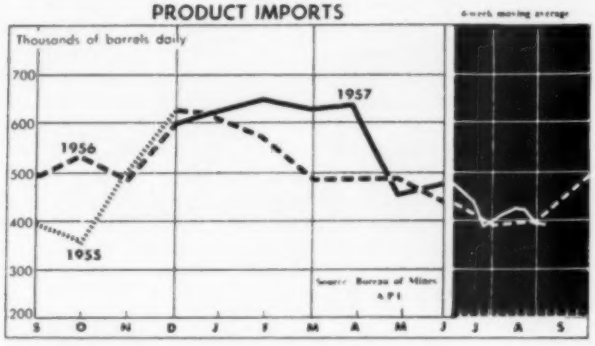
CRUDE IMPORTS



WILDCAT COMPLETIONS



PRODUCT IMPORTS

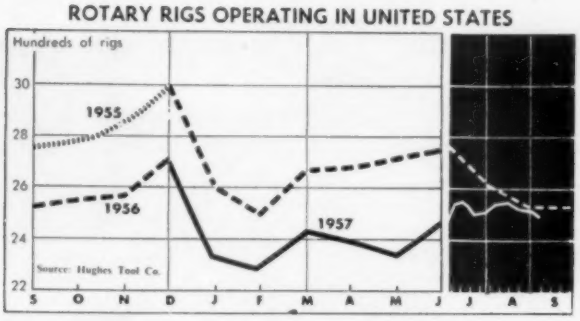


WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 7, 1957

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1957	1956	Total	Crude	Cond.	Gas	Dry	1957	1956
Alabama	1	1	0	0	0	0	3,414	63	‡77	0	0	0	0	0	20	‡34
Arkansas	34	26	0	1	7	0	95,272	759	595	5	2	0	0	3	136	130
California	31	20	0	1	10	0	152,264	1,463	1,520	7	1	0	0	6	363	349
Colorado	18	6	0	1	11	0	84,821	579	807	10	1	0	0	9	391	417
Illinois	55	25	0	0	30	0	123,472	1,761	2,658	7	0	0	0	7	442	522
Indiana	22	6	0	0	16	0	42,217	447	458	4	0	0	0	4	88	94
Kansas	96	57	0	8	29	2	329,522	2,901	3,499	16	4	0	1	11	579	739
Kentucky	35	8	0	6	21	0	47,495	994	1,261	9	1	0	0	8	200	302
Louisiana	64	32	0	2	30	0	380,223	2,565	2,635	13	1	0	0	12	458	536
North	40	22	0	1	17	0	138,495	927	1,130	6	1	0	0	5	123	183
South	23	9	0	1	13	0	229,886	1,174	1,208	7	0	0	0	7	277	298
Offshore	1	1	0	0	0	0	11,842	464	297	0	0	0	0	0	58	55
Michigan	4	0	0	0	4	0	14,813	280	303	2	0	0	0	2	103	115
Mississippi	7	4	0	0	3	0	47,710	259	309	2	1	0	0	1	137	147
Montana	6	3	0	1	2	0	27,944	275	299	2	0	0	0	2	98	108
Nebraska	12	4	0	0	8	0	70,176	602	697	8	2	0	0	6	333	342
New Mexico	51	28	0	16	7	0	238,583	1,461	1,341	4	0	0	0	4	194	182
Northwest	23	6	0	16	1	0	103,705	592	563	0	0	0	0	0	72	61
Southeast	28	22	0	0	6	0	134,878	869	778	4	0	0	0	4	122	121
New York	11	4	0	0	2	5	18,592	317	.....	2	0	0	0	2	6	.....
North Dakota	5	4	0	0	1	0	44,912	181	177	1	0	0	0	1	77	57
Ohio	26	17	0	2	5	2	55,578	769	727	0	0	0	0	0	9	6
Oklahoma	125	62	4	9	43	7	475,263	4,287	5,910	21	3	1	3	14	495	618
Pennsylvania	31	13	0	5	3	10	65,890	473	†756	0	0	0	0	0	39	†17
Texas	435	255	5	12	160	3	1,823,388	14,983	15,465	87	3	0	2	82	3,647	3,924
District 1	33	16	1	0	16	0	83,107	865	*2,215	11	0	0	0	11	302	*752
District 2	12	5	0	3	4	0	74,149	524	*1,829	0	0	0	0	0	194	*592
District 3	32	13	3	0	15	1	201,156	1,194	.....	5	0	0	0	5	342	.....
District 4	31	13	0	1	16	1	161,793	972	.....	8	0	0	0	8	325	.....
East	29	19	0	0	10	0	122,723	894	803	9	0	0	0	9	261	289
District 7-B	51	21	0	0	30	0	160,806	1,950	.....	13	0	0	0	13	690	.....
West	119	98	1	1	18	1	601,509	4,255	4,143	13	0	0	1	12	610	656
District 9	108	54	0	4	50	0	331,750	3,342	*5,546	27	2	0	1	24	850	*1,552
District 10	20	16	0	3	1	0	86,395	987	929	1	1	0	0	0	73	83
Utah	7	3	0	1	3	0	25,785	143	89	1	0	0	0	1	75	53
West Virginia	23	8	0	13	2	0	56,807	448	450	0	0	0	0	0	20	13
Wyoming	24	5	0	1	15	3	116,875	592	576	9	2	0	0	7	203	160
Miscellaneous (S. D.)	3	0	0	0	3	0	8,459	71	70	3	0	0	0	3	54	62
Total U. S.	**1,126**	591	9	79	415	32	4,349,475	36,673	40,679	**213**	21	1	6	185	8,167	8,927
Total prev. week	1,096	554	12	77	441	12	4,349,727	.....	.....	218	17	1	5	195	.....	.....
Cum. 1957	36,673	19,033	333	2,637	13,905	765	151,465,667	.....	.....	8,167	838	67	292	6,970	.....	.....
Western Canada	34	24	0	3	7	0	165,853	2,081	2,089	6	2	0	1	3	586	.....

*Districts: 2 & 3, 1 & 4, 9 & 7-B, formerly combined. †Incl. New York. ‡Incl. Florida and Georgia.

ROTARY RIGS OPERATING IN UNITED STATES

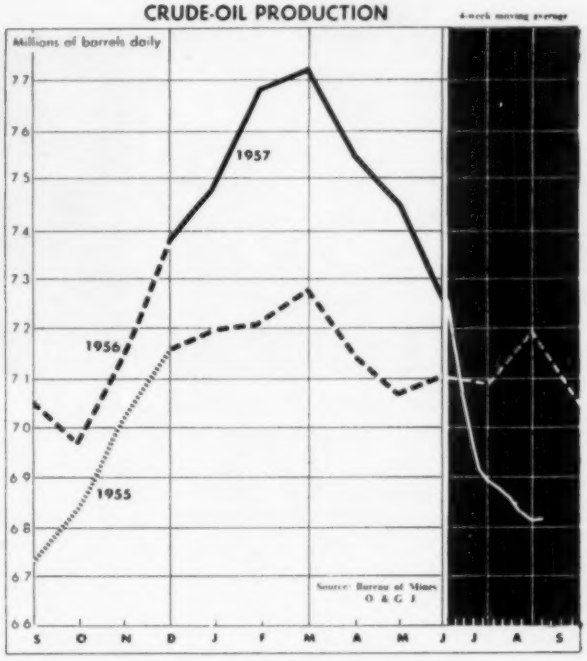


ACTIVE ROTARY RIGS*

Area—	9-9-57	9-2-57	8-26-57	9-10-56
Alabama	4	3	4	9
Arkansas	26	27	25	16
Arizona	....	....	....	1
California	94	98	102	112
Colorado	63	65	62	69
Florida	1	1	1	2
Georgia	....	....	....	....
Idaho	....	....	....	....
Illinois	54	58	46	72
Indiana	8	7	9	8
Iowa	2	2	2	1
Kansas	151	153	157	159
Kentucky	10	12	14	12
Louisiana	442	439	455	434
North	67	64	67	63
South	276	272	284	371
Offshore	99	103	104	(†)
Maryland	1	1	1	0
Michigan	13	15	14	13
Missouri	....	....	....	1
Montana	26	23	30	47
Mississippi	42	43	38	34
Nebraska	36	36	32	26
Nevada	....	....	1	1
New Mexico	153	164	166	145
New York	....	....	....	....
North Dakota	37	37	32	25
Ohio	....	....	1	1
Oklahoma	255	243	244	255
Oregon	1	1	1	0
Pennsylvania	14	14	12	6
South Dakota	1	....	....	....
Texas	910	923	910	947
Gulf Coast	201	195	207	237
Offshore	4	3	3	(‡)
West	361	374	357	345
North	292	296	292	300
East	52	55	51	65
Tennessee	1	1	1	0
Utah	68	66	64	25
Washington	1	1	1	0
West Virginia	4	4	5	1
Wyoming	76	73	77	85
Virginia	1	1	1	0
Total United States	2,495	2,511	2,508	2,507
Western Canada	205	192	189	255
Eastern Canada	3	3	3	C
Grand total	2,703	2,706	2,700	2,762

*Hughes Tool Co. †Included with South Louisiana. ‡Included with Texas Gulf Coast.

CRUDE-OIL PRODUCTION

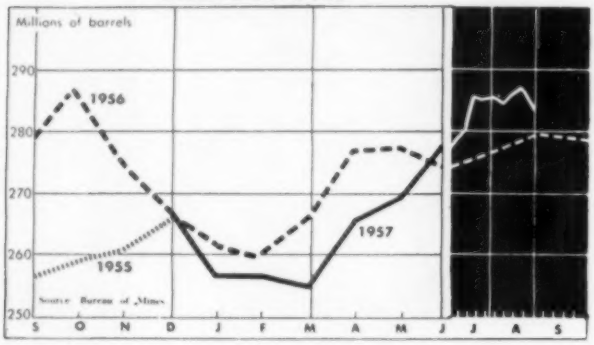


DAILY AVERAGE PRODUCTION FOR WEEK

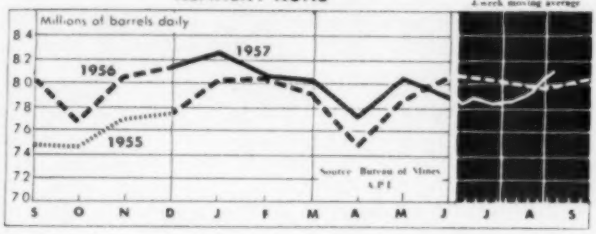
	September 7, 1957 Crude oil	Lease condensate	Total	Aug. 31 total
Alabama	14,680	.....	14,680	15,500
Arkansas	80,660	230	80,890	81,000
California	924,600	.....	924,600	923,800
Colorado	149,000	.....	149,000	149,400
Eastern	52,500	.....	52,500	53,000
Florida	1,250	.....	1,250	1,300
Illinois	215,500	.....	215,500	162,200
Indiana	37,500	.....	37,500	29,700
Kansas	†326,590	.....	†326,590	†338,450
Kentucky	46,800	.....	46,800	39,100
Louisiana	713,500	70,500	784,000	796,000
North	123,500	2,500	126,000	126,000
South	590,000	68,000	658,000	670,000
Michigan	26,800	.....	26,800	25,100
Mississippi	99,275	4,275	103,550	108,200
Montana	75,650	.....	75,650	75,200
Nebraska	55,100	.....	55,100	54,000
Nevada	100	.....	100	100
New Mexico	248,200	3,700	251,900	248,000
North Dakota	38,100	.....	38,100	38,100
Oklahoma	†560,300	.....	†560,300	†552,800
Texas	2,720,000	54,400	2,774,400	2,813,700
Dist. 1	49,500	500	50,000	51,450
Dist. 2	125,500	8,600	134,100	134,450
Dist. 3	393,000	26,800	419,800	430,400
Dist. 4	207,000	6,100	213,100	216,200
Dist. 5	35,500	275	35,775	36,300
Dist. 6	120,500	5,900	126,400	128,300
East Texas field	170,500	.....	170,500	173,000
Dist. 7-B	153,000	50	153,050	151,050
Dist. 7-C	142,000	3,675	145,675	146,575
Dist. 8	1,012,000	1,400	1,013,400	1,034,200
Dist. 9	204,500	600	205,100	204,350
Dist. 10	107,000	500	107,500	107,425
Utah	11,350	.....	11,350	10,700
Wyoming	289,150	.....	289,150	289,200
Others	‡250	.....	‡250	‡200
Total U. S.	6,686,855	133,105	**6,819,960**	6,804,750
Change from previous week, up			**15,210**	
Canada	†458,000	.....	†458,000	†499,500
Total U. S. production—Jan. 1-Sept. 7			§1,829,482,845 bbl.	
Same period last year (crude plus cond.)			*1,795,877,459 bbl.	

*Includes 30,836,080 bbl. condensate. †Week ended previous Monday. ‡South Dakota. §Revised.

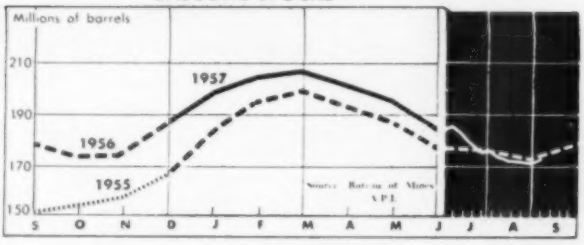
CRUDE-OIL STOCKS



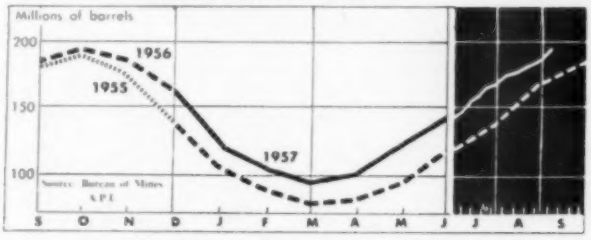
REFINERY RUNS



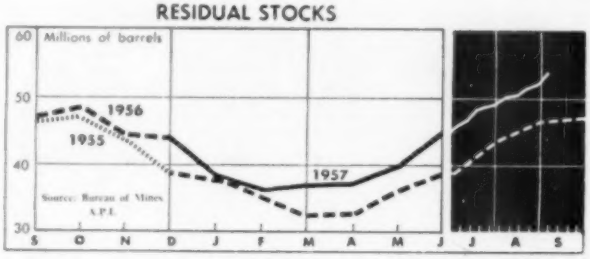
GASOLINE STOCKS



MIDDLE-DISTILLATE STOCKS



RESIDUAL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

	8-31-57	8-24-57	9-1-56
Pennsylvania Grade	3,173	3,241	2,512
Other Appalachian	1,606	1,599	2,464
Illinois, Indiana, and Michigan	11,105	11,451	10,626
Nebraska and North Dakota	2,621	2,491	2,554
Kansas	11,000	11,097	10,106
Oklahoma	21,555	22,085	26,683
Arkansas	2,815	2,766	3,081
Louisiana	18,840	19,350	17,989
North	2,980	3,148	2,618
South	15,860	16,202	15,371
Mississippi, Ala., and Fla.	2,581	2,445	3,085
New Mexico	8,923	9,773	8,136
Texas	129,523	130,581	122,351
East Texas proper	10,161	10,482	8,735
West Texas	62,851	62,730	59,144
Texas Gulf	24,195	24,564	22,815
Other Texas	32,316	32,805	31,657
Wyoming	17,342	17,445	18,092
Other Rocky Mountain	6,065	6,360	6,474
California	30,458	30,124	29,205
Foreign	†16,616	16,870	15,362
Total	284,223	287,678	278,720

*Bureau of Mines. †Includes 4,193,000 bbl. in California.

A.P.I. REFINERY REPORT, SEPTEMBER 6, 1957

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1956—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,300	559.0	20.7	340.6	252.3	42,676	14,447	59,027	13,274	1,105	467.3	29.3	306.1	174.8
Appalachian:														
District 1	112	49.8	2.3	25.6	7.1	4,421	612	3,271	534	106	44.7	4.8	25.1	4.3
District 2	128	55.0	6.4	9.0	11.3	2,511	649	1,027	219	98	52.3	3.5	16.8	12.6
Ind., Ill., Ky.	1,461	759.6	59.7	318.6	177.2	29,746	6,836	22,980	5,243	1,451	764.4	70.4	307.2	147.3
Minn., Wis., Dak.	101	47.8	7.2	26.4	9.9	5,662	1,681	7,910	501	91	43.0	5.4	23.8	8.8.
Okla., Kans., Mo.	752	452.0	15.0	186.1	27.4	14,106	1,941	14,649	1,032	671	374.5	14.0	165.8	25.9
Inland Texas	296	223.3	4.7	58.7	22.3	6,561	473	2,759	1,929	282	208.4	7.8	53.5	22.3
Texas Gulf Coast	1,859	982.6	104.3	480.8	243.0	23,182	3,058	18,373	8,208	1,944	917.2	116.9	482.8	245.7
La. Gulf Coast	647	370.6	39.7	159.7	55.0	9,582	3,437	7,886	1,630	699	347.4	59.2	197.0	49.7
N. La., Ark.	92	28.0	5.9	21.7	6.3	4,128	937	2,275	170	103	40.1	8.2	23.3	5.4
Rocky Mountain:														
New Mexico	24	12.3	0.7	4.9	4.3	366	7	89	82	24	13.0	0.3	4.8	3.2
Other Rocky Mt.	290	145.1	5.6	58.7	39.4	5,662	333	3,232	940	269	127.9	5.1	57.9	33.9
West Coast	1,208	523.0	6.7	181.6	329.4	24,949	416	16,408	20,256	1,181	502.3	4.2	181.0	328.4
Sept. 6, 1957	8,270	4,208.1	278.9	1,872.4	1,184.9	173,552	34,827	159,886	54,019	8,024	3,902.5	329.1	1,845.1	1,062.3
Aug. 30, 1957	8,327	4,073.7	267.3	1,891.6	1,087.0	171,683	34,114	154,876	52,472	.....	.....	.....	.....	.....
Sept. 7, 1956	8,187	4,050.4	327.6	1,868.6	1,117.1	175,955	32,698	142,731	47,198	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
Regular (89 octane)	11.50-11.75
Premium (98 octane)	14.25-14.50
Gulf Coast (cargoes for coastwise or export movements):	
Regular (90 octane)	11.00-11.50
Regular (92 octane)	11.25-11.75
Premium (97 octane)	12.75-13.25
Premium (98 octane)	13.00-13.50
California (rack):	
Regular (88 octane)	12.9
Premium (96 octane)	14.9
Premium (98 octane)	15.4
Caribbean area (cargoes):	
Regular (87 octane)	10.875
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.0
Breckenridge:	
Grade 26-70	3.5

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.50-10.00
Diesel oil (58 d.i. and above)	9.125-9.75
Distillate No. 1	9.125-9.75
Distillate No. 2	8.50-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	8.75-9.50
Distillate No. 2	8.75-9.50
New York Harbor (barges):	
Kerosine 41-43	10.75
Distillate No. 2	10.25
Diesel fuel, 48-52 d.i.	10.55
Caribbean area (cargoes):	
Distillate No. 2	9.00

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
★ Residual fuel (max. 1% S)	$1.75-2.00
Gulf Coast (cargoes):	
Bunker C fuel	$2.50-2.75
New York Harbor (barges):	
Bunker C fuel	$2.95
Caribbean (cargoes):	
Bunker C	$2.55
California (rack):	
Bunker C fuel, Los Angeles	$2.85-3.00

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	25.5
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	22.25
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	28
200 vis. neutral (180 at 100°), 25 p.t.	26

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.67	....	....	....	....
15-15.9	2.71	....	....	....	$1.89
16-16.9	2.74	....	....	....	1.94
17-17.9	2.78	....	....	....	1.99
18-18.9	2.82	....	....	....	2.04
19-19.9	2.85	....	....	....	2.09
20-20.9	2.89	$2.75	....	$2.62	2.14
21-21.9	2.93	2.77	....	2.64	2.19
22-22.9	2.97	2.79	....	2.66	2.24
23-23.9	3.01	2.81	$3.44	2.68	2.29
24-24.9	3.05	2.83	3.46	2.70	2.34
25-25.9	3.09	2.85	3.48	2.72	2.39
26-26.9	3.13	2.87	3.50	2.74	2.44
27-27.9	3.17	2.89	3.52	2.76	2.49
28-28.9	3.22	2.91	3.54	2.78	2.54
29-29.9	3.27	2.93	3.56	2.80	2.59
30-30.9	3.32	2.95	....	2.82	2.63
31-31.9	3.38	2.97	....	2.84	2.67
32-32.9	3.44	2.99	....	2.86	2.71
33-33.9	3.50	3.01	....	2.88	2.75
34-34.9	3.56	3.03	....	2.90	2.79
35-35.9	3.61	3.05	....	2.92	2.83
36-36.9	3.65	3.07	....	2.94	2.87
37-37.9	3.68	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma, part of Kansas, North Dakota, West Texas (sweet) and North Central Texas. †Low cold test Gulf Coast. ‡Sour.

Effective dates: California January 17, 1957, east of California, January 3-January 10, 1957; Pennsylvania Grade, July 26, 1957.

Some crudes in North Central Texas and West Central Texas, are on the intermediate schedules.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	4.65
Middle District	4.47
Southwest Pennsylvania	4.18
West Virginia	4.00
Buckeye Grade	4.00
Zanesville Grade	3.04
Illinois Basin	3.15
Canada:	
Leduc-Woodbend	2.74
Redwater (Alta)	2.63
Smiley (Sask.)	2.40
Pembina	2.61

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26.5°-26.9°, Amuay*	2.55
Quiriquire, 16.5°-16.9°, Caripito	2.45
Lagunillas heavy, flat, Amuay or Las Piedras*	2.38
Bachaquero, flat, Las Piedras*	2.23

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 36.0°-36.9°, Fao	2.00
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
★ Arabian, 36.0°-36.9°, Sidon	2.59-2.69
★ Iraq, 36.0°-36.9°, Tripoli, Banias	2.59-2.69
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

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★ Sidon-U.K., dirty (Scale—55%) (12s. 9d.)	1.77

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1 Pacific HVTB (unused) 1270 GPM—408' Hd.
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5—Steel 1,000, 900, 800, 600, 500 Sq. Ft.
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HELP WANTED

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Box K-341
The Oil and Gas Journal
Tulsa, Oklahoma

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Tulsa, Oklahoma.

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SITUATIONS WANTED

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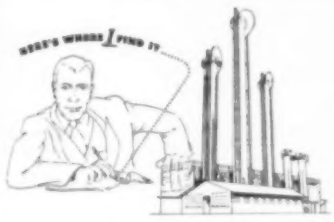

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LEGAL

The National Iranian Oil Company hereby informs all interested persons and Companies that, in accordance with the provisions of the Iranian Petroleum Act of July 31st, 1957, any inquiries, requests for information, or proposals of any nature whatsoever in connection with the performance of petroleum operations in Iran must be addressed direct to: The Chairman of the Board of Directors, National Iranian Oil Company, Avenue France, Tehran, Iran. Any communication made through other channels shall have no effect.

LEGAL

NOTICE TO BIDDERS
OFFSHORE OIL AND GAS LEASES

The Commonwealth of Pennsylvania, Department of Forests and Waters, Harrisburg, Pennsylvania, will receive sealed bids for Petroleum and Natural Gas leases until 2:00 p.m., E.D.S.T., September 24, 1957 at Room 512, Education Building, Harrisburg, Pennsylvania, which will be publicly opened and read at that time, for the leasing of certain offshore lands in Lake Erie. The Blocks are more particularly described as follows:

BLOCK 1: All that portion of Pennsylvania's offshore waters in Lake Erie bounded on the North by latitude 42° 05' North; on the East by longitude 80° 25' West; on the South by a line parallel to the Lake shore and one-half mile therefrom; and on the West by the Ohio-Pennsylvania boundary. Extreme care shall be used in drilling within three miles of the shore to protect fish breeding grounds. Containing approximately 19,130 acres.

BLOCK 2: All that portion of Pennsylvania's offshore waters in Lake Erie bounded on the North by latitude 42° 20' North; on the East by longitude 79° 50' West; on the South by latitude 42° 15' North; and on the West by longitude 79° 55' West. Extreme care shall be used in drilling within three miles of the shore to protect fish breeding grounds. Containing approximately 16,580 acres.

The Commonwealth is considered to be the owner of these Oil and Gas rights but makes no warranty as to the presence of Oil or Gas nor as to its ownership thereof and bidders assume the risk of proving title.

Forms of the required bid proposal, the lease agreement and maps showing the areas, may be obtained by contacting The Division of Minerals, Department of Forests and Waters, Education Building, Harrisburg, Pennsylvania.

All bids must be submitted in sealed envelopes to the above address and be marked on the envelope "Bid for Oil and Gas Lease, Block 1 or 2."

A certified check, bank cashier's or trust company treasurer's check in the amount of $2,500.00 must accompany each bid for each tract as a guarantee of the bid. The proceeds of the bid check shall be retained by the Commonwealth and considered as liquidated damages if any bidder shall fail to execute a lease tendered by the Commonwealth. Checks will be returned to the unsuccessful bidder upon full execution of the lease.

The Department reserves the right to reject any and all bids and to waive any informalities, defects or irregularities in the bids.

MAURICE K. GODDARD
Secretary of Forests and Waters

THOMAS D. McBRIDE
Attorney General.

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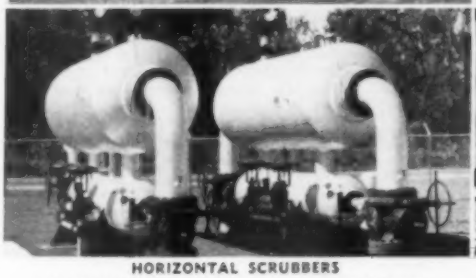

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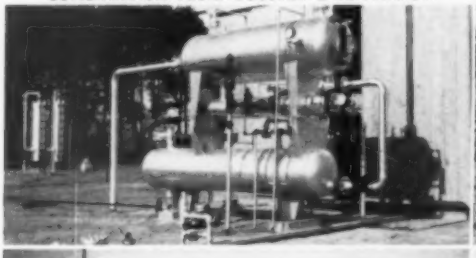
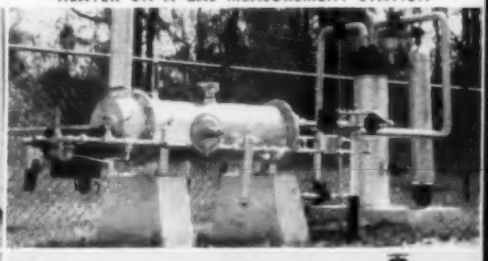
COMBINATION FLUID BOOSTER & SEPARATOR



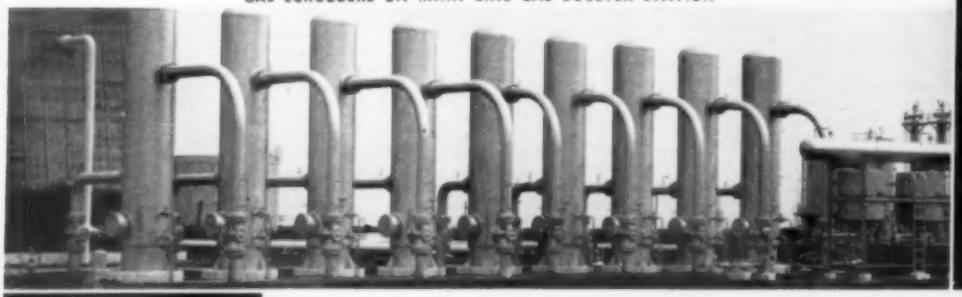
HEATER ON A GAS MEASUREMENT STATION



TANK CAR LOADING RACK

INDIRECT GAS FIRED HEATERS

GAS SCRUBBERS ON MAIN LINE GAS BOOSTER STATION



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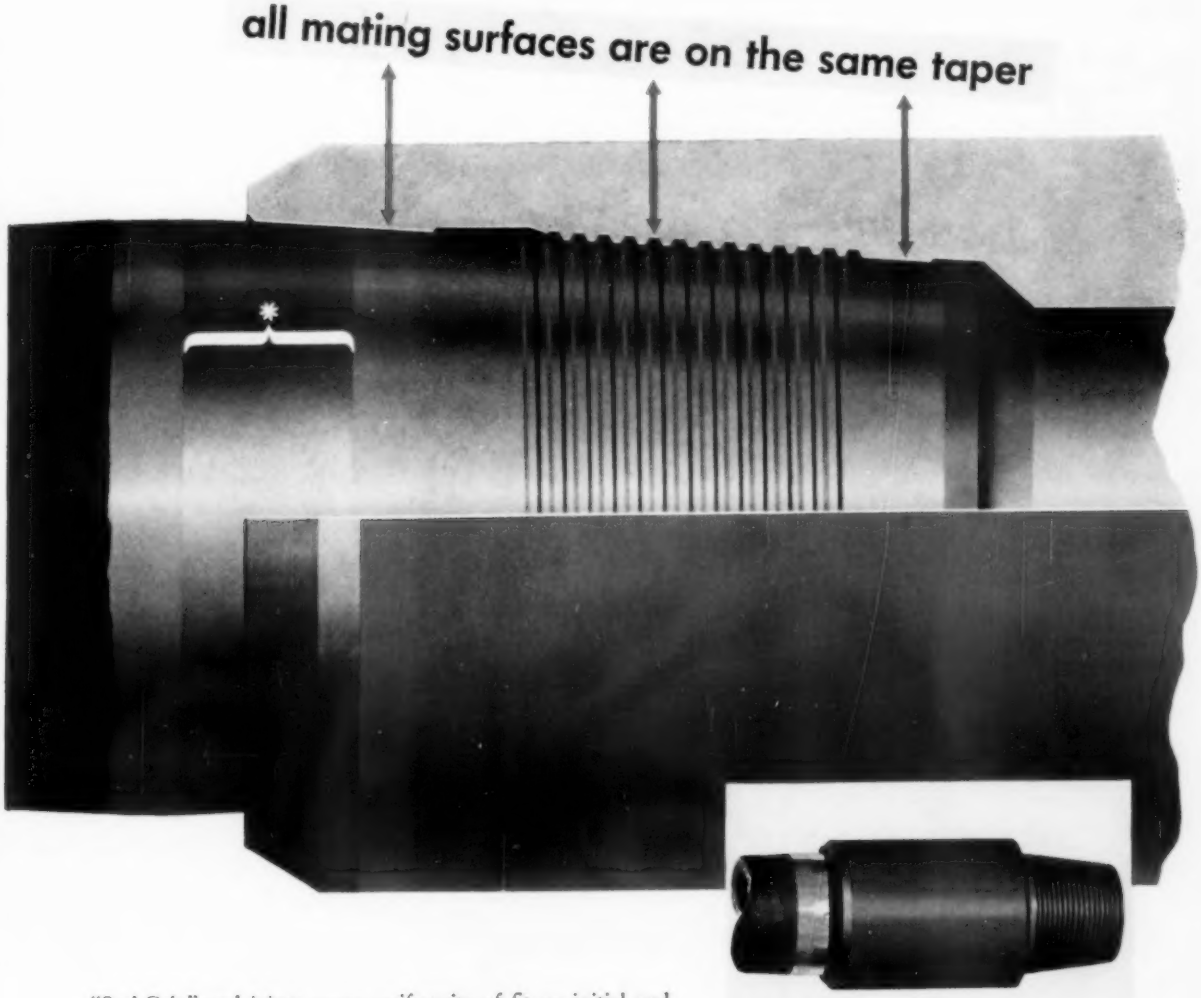

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